Global, regional, and national age-sex-specific mortality and life expectancy, 1950–2017: a systematic analysis for the Global Burden of Disease Study 2017

*GBD 2017 Mortality Collaborators**

Lancet 2018; 392: 1684–735

This online publication has been corrected. The corrected version first appeared at thelancet.com on June 20, 2019

*Collaborators listed at the end of the paper

Correspondence to: Prof Christopher J L Murray, Institute for Health Metrics and Evaluation, Seattle, WA 98121, USA cjlm@uw.edu

Summary

Background Assessments of age-specific mortality and life expectancy have been done by the UN Population Division, Department of Economics and Social Affairs (UNPOP), the United States Census Bureau, WHO, and as part of previous iterations of the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD). Previous iterations of the GBD used population estimates from UNPOP, which were not derived in a way that was internally consistent with the estimates of the numbers of deaths in the GBD. The present iteration of the GBD, GBD 2017, improves on previous assessments and provides timely estimates of the mortality experience of populations globally.

Methods The GBD uses all available data to produce estimates of mortality rates between 1950 and 2017 for 23 age groups, both sexes, and 918 locations, including 195 countries and territories and subnational locations for 16 countries. Data used include vital registration systems, sample registration systems, household surveys (complete birth histories, summary birth histories, sibling histories), censuses (summary birth histories, household deaths), and Demographic Surveillance Sites. In total, this analysis used 8259 data sources. Estimates of the probability of death between birth and the age of 5 years and between ages 15 and 60 years are generated and then input into a model life table system to produce complete life tables for all locations and years. Fatal discontinuities and mortality due to HIV/AIDS are analysed separately and then incorporated into the estimation. We analyse the relationship between age-specific mortality and development status using the Socio-demographic Index, a composite measure based on fertility under the age of 25 years, education, and income. There are four main methodological improvements in GBD 2017 compared with GBD 2016: 622 additional data sources have been incorporated; new estimates of population, generated by the GBD study, are used; statistical methods used in different components of the analysis have been further standardised and improved; and the analysis has been extended backwards in time by two decades to start in 1950.

Findings Globally, 18·7% (95% uncertainty interval 18·4–19·0) of deaths were registered in 1950 and that proportion has been steadily increasing since, with 58·8% (58·2–59·3) of all deaths being registered in 2015. At the global level, between 1950 and 2017, life expectancy increased from 48·1 years (46·5–49·6) to 70·5 years (70·1–70·8) for men and from 52·9 years (51·7–54·0) to 75·6 years (75·3–75·9) for women. Despite this overall progress, there remains substantial variation in life expectancy at birth in 2017, which ranges from 49·1 years (46·5–51·7) for men in the Central African Republic to 87·6 years (86·9–88·1) among women in Singapore. The greatest progress across age groups was for children younger than 5 years; under-5 mortality dropped from 216·0 deaths (196·3–238·1) per 1000 livebirths in 1950 to 38·9 deaths (35·6–42·83) per 1000 livebirths in 2017, with huge reductions across countries. Nevertheless, there were still 5·4 million (5·2–5·6) deaths among children younger than 5 years in the world in 2017. Progress has been less pronounced and more variable for adults, especially for adult males, who had stagnant or increasing mortality rates in several countries. The gap between male and female life expectancy between 1950 and 2017, while relatively stable at the global level, shows distinctive patterns across super-regions and has consistently been the largest in central Europe, eastern Europe, and central Asia, and smallest in south Asia. Performance was also variable across countries and time in observed mortality rates compared with those expected on the basis of development.

Interpretation This analysis of age-sex-specific mortality shows that there are remarkably complex patterns in population mortality across countries. The findings of this study highlight global successes, such as the large decline in under-5 mortality, which reflects significant local, national, and global commitment and investment over several decades. However, they also bring attention to mortality patterns that are a cause for concern, particularly among adult men and, to a lesser extent, women, whose mortality rates have stagnated in many countries over the time period of this study, and in some cases are increasing.

Funding Bill & Melinda Gates Foundation.

Copyright © 2018 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license.

Research in context

Evidence before this study

Several organisations report on aspects of all-cause mortality or life expectancy: the UN Population Division, Department of Economics and Social Affairs (UNPOP), the United States Census Bureau, and WHO. Additionally, previous iterations of the Global Burden of Disease Study (GBD) have produced these estimates on an annual basis. UNPOP reports age-specific mortality by 5-year age groups for 162 countries and for time periods that cover 5 calendar years; these estimates are updated every 2 years (most recently in June, 2017). The United States Census Bureau produces mortality assessments for 15–25 countries per year, and WHO reports periodically on life expectancy and sometimes on other measures of mortality and bases its estimates on results from the UNPOP. The most recent release of estimates by WHO was in January, 2017, based on UNPOP estimates from 2015. GBD 2016 provided comprehensive assessment of age-sex-specific mortality for 195 countries and territories from 1970 to 2016 that were compliant with the Guidelines on Accurate and Transparent Reporting of Health Estimates.

Added value of this study

The most important changes in GBD 2017 are the independent estimation of population and a comprehensive update on fertility, which are described in a separate paper. There are several countries with significant differences in population size between the UNPOP estimates and the new GBD estimates. Since population is the denominator for mortality calculations, this leads to substantial changes in life expectancy and age-specific mortality rates in several countries. There were four major data additions and improvements that related to the estimation of mortality. First, for the estimation of population size, we systematically searched for census data and found data from 1257 censuses, which are now used in the analysis and which enabled an extended analysis of completeness using death distribution methods in more locations than previous iterations. Second, in the estimation of adult mortality, we included data from 31 Demographic Surveillance Sites (DSS) which were adjusted based on the relationship between DSS under-5 death rates and national under-5 death rates. Third, we used published sources to create a database of fatal discontinuities from conflicts and natural disasters that extends back to 1950; each fatal discontinuity has been given a unique ID that tags the reported deaths to a location, date, and type of discontinuity. Fourth, GBD 2017 included an additional 622 data sources that were not available for GBD 2016 and which do not fall into the three categories already described. The main methodological improvements fall into two categories: the first category is enhancements to the modelling framework, which improved the estimation of both child mortality, defined as the probability of death below the age of 5 years, and adult mortality, a term we use to refer to the probability of death between ages 15 and 60 years. For child mortality, we standardised hyperparameter selection for the spatiotemporal Gaussian process regression models, which enhances the comparability of results between locations and across time. For adult mortality, we also standardised hyperparameter selection and added child mortality as a covariate to the model. These changes had minimal effect on the mean estimate but changed the width of the uncertainty intervals in small populations and locations with sparse data. The second category encompasses three substantial improvements to the GBD model life table system: first, we revised the entire database to reflect the change in population counts. Second, each life table in the database was assigned a quality score using explicit criteria related to the variance in the slope of the death rate with respect to age, reductions in mortality at older ages compared with younger ages (age >60 years), and other unexpected crossovers. On the basis of these quality scores, life tables have been assigned to three categories: high quality for universal use, acceptable quality for use in the creation of location-specific standards, and unacceptable quality. Third, we estimated complete single-year life tables for each sex, location, and year instead of abridged life tables as in previous iterations of the GBD.

In GBD 2017, for the first time, we are reporting a complete time series of trends in age-specific mortality and life expectancy since 1950. The extension of the analysis back in time provides the opportunity to analyse and report on longer-term trends in age-specific mortality.

Implications of all the available evidence

By using internally consistent estimates of deaths, births, and population over time, this analysis of trends in age-sex-specific death rates and summary measures such as life expectancy provides important perspectives on how mortality has been evolving since 1950. The findings of this study highlight global successes, such as the remarkable decline in under-5 mortality. This great success story reflects significant local, national, and global commitment and investment over several decades, a commitment that has intensified since the turn of the century. At the same time, our findings also bring attention to mortality patterns that are cause for concern, particularly among men aged 20–45 years and, to a lesser extent, women aged 20–45 years. In these groups, our findings show mortality rates that have stagnated over the time period covered by this study, and in some cases, are increasing. Comparing levels of mortality to those expected on the basis of development status, as measured with the Socio-demographic Index, provides insights into which countries have achieved lower and which countries are experiencing higher mortality rates than would be expected based on their level of development. Our findings show enormous variation in progress achieved across locations and ages, with countries that are performing better than expected in all regions of the world. Our results also highlight that greater emphasis needs to be placed on understanding the drivers of success for countries that have performed better than expected and that urgent attention needs to be brought to those countries that are lagging behind.

Introduction

Measurement of mortality has always been crucial for populations, and mortality is a quantity that societies have attempted to track since ancient times.[1,2] More recently, its relevance and importance have been highlighted in the global agenda in the form of the health-related Sustainable Development Goals (SDGs), which not only include two indicators expressly focused on all-cause mortality (SDG indicators 3.2.1, under-5 mortality, and 3.2.2, neonatal mortality), but also death registration (SDG indicator 17.19.2c) and ten indicators of cause-specific or risk-attributable mortality.[3] The prominence of mortality among the health-related SDGs intensifies the need for comparable, robust measurements of mortality that can be used for monitoring progress on mortality levels and trends across countries. National governments and international agencies alike need reliable evidence to identify and then prioritise addressing the largest challenges in improving survival, particularly during the SDG era.

Amid global gains in life expectancy and significant reductions in child mortality over the past few decades, concerning trends have surfaced in several countries and demographic groups, which have been attributed to a wide range of determinants of health.[4–8] For example, although many high-income countries, including the USA and the UK, experienced large gains in life expectancy for many decades, the pace of progress has stalled in recent years, particularly in the past decade, and within-country inequalities in life expectancy have widened.[9–14] For other countries, such as Syria and Yemen, civil war has effectively erased—and reversed—years of steady gains.[14,15] In Mexico, studies have highlighted a combination of surging interpersonal violence and non-communicable diseases (NCDs) as the main factors underlying rising age-specific mortality among adult men, while in the USA, drug use disorders, suicide, cirrhosis, and diabetes are considered to be among the main culprits for plateaued mortality improvements among men.[9,10,11,16] Increasing rates of obesity are also viewed as a probable factor underlying the slowing of progress in female life expectancy in various countries.[17–19] Changes in age-specific mortality rates and life expectancy can be used to track the impact of population-wide health threats, such as the HIV epidemic in sub-Saharan Africa, and also to quantify uncharacteristically high mortality experiences, such as the excess adult male mortality in central and eastern European countries during 1990s.[20–23] Accurate monitoring of levels and trends of mortality on a timely basis can provide crucial information for deploying resources and effective interventions at the population level.

See **Online** for appendix 1

For the **statistical code** see https://github.com/ihmeuw/ihme-modeling

The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) provides the only source of annually updated age-sex-specific mortality for countries across the world. Three other analytical efforts exist that provide estimates of age-specific mortality for a broad set of countries; however, we believe that these are not as comprehensive or timely as the GBD. The United Nations Population Division, Department of Economics and Social Affairs (UNPOP) has reported on life expectancy and age-specific mortality for 5-year calendar intervals by age, sex, and country since 2005 and for 201 countries. Their estimates are updated biannually; however, the estimates are not reported with uncertainty intervals (UIs).[24] The US Census Bureau analyses only 15–25 countries per year and updates demographic estimates for them.[25] WHO estimates of mortality are largely based on UNPOP estimates that have been interpolated to single years with some modifications for countries with complete vital registration (VR).[26] In addition to these cross-national efforts, many countries produce their own estimates of age-specific mortality, which often differ from the international assessments.[27–29]

GBD 2017 represents the third iteration of the annual updates of the GBD.[14,30] This version of the GBD reports on trends in age-specific mortality and summary measures of mortality, such as life expectancy, with four main improvements. First, new data sources that have been released or reported since GBD 2016 have been incorporated. Second, for the first time, estimates of age-sex-specific population generated in the GBD are used in the estimation of all-cause mortality, whereas previous efforts by the GBD used the UN Population Division estimates of population by age and sex.[31] Third, statistical methods used in different components of the analysis have been further standardised and improved. Lastly, we have extended the analysis and reporting of age-specific mortality back to 1950 to further contribute to research and analyses of long-term trends in mortality and life expectancy.

Methods

Overview

As with GBD 2016, this analysis adheres to the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) standards developed by WHO and others.[32] A table detailing our adherence to GATHER is included in appendix 1; statistical code used in the entire process is publicly available online. Analyses were done with Python versions 2.5.4 and 2.7.3, Stata version 13.1, and R version 3.1.2.

The methods used to produce estimates of age-specific mortality remain similar to those used in GBD 2016. Here we provide a broad overview and highlight the major changes since GBD 2016. All other details are included in appendix 1.

Geographical units and time periods

The GBD is hierarchically organised by geographic units or locations, with seven super-regions, 21 regions nested within those super-regions, and 195 countries or territories within the 21 regions. Each year, GBD includes subnational analyses for a few new countries and continues to provide subnational estimates for countries that were added in previous cycles. Subnational estimation in GBD

2017 includes five new countries (Ethiopia, Iran, New Zealand, Norway, Russia) and countries previously estimated at subnational levels (GBD 2013: China, Mexico, and the UK [regional level]; GBD 2015: Brazil, India, Japan, Kenya, South Africa, Sweden, and the USA; GBD 2016: Indonesia and the UK [local government authority level]). All analyses are at the first level of administrative organisation within each country except for New Zealand (by Māori ethnicity), Sweden (by Stockholm and non-Stockholm), and the UK (by local government authorities). All subnational estimates for these countries were incorporated into model development and evaluation as part of GBD 2017. To meet data use requirements, in this publication we present all subnational estimates excluding those pending publication (Brazil, India, Japan, Kenya, Mexico, Sweden, the UK, and the USA); these results are presented in appendix tables and figures (appendix 2). Subnational estimates for countries with populations larger than 200 million (as measured with our most recent year of published estimates) that have not yet been published elsewhere are presented wherever estimates are illustrated with maps, but are not included in data tables.

Data and data processing

In the estimation of age-specific mortality for GBD 2017, we used five types of data. These were data from VR systems, sample registration systems, household surveys (complete birth histories, summary birth histories, sibling histories), censuses (summary birth histories, household deaths), and Demographic Surveillance Sites (DSS).

The most robust source for estimating age-specific mortality is a VR system that records all deaths by age, sex, and location. Our analysis of mortality starts with collating all publicly available VR data plus data shared directly by governments or GBD collaborators from VR systems. We evaluate the completeness of VR data separately for deaths under the age of 5 years and deaths over the age of 15 years. For under-5 deaths, we statistically compare VR-based death rates with those recorded in censuses or surveys. For deaths over the age of 15 years, we apply three methods for detecting under-registration: generalised growth balance, synthetic extinct generations, and a hybrid method that uses both methods.[33–38] These methods are collectively described as death distribution methods because they use the demographic balance equation to infer completeness of registration. Age misreporting and migration affect these methods.[33,38] We used the spatiotemporal regression framework with the results of these methods for all intercensal intervals to produce a coherent time series of completeness for each location. For this step, the first stage of the model uses completeness of child death registration as a covariate and then applies time and space weights on the residuals to produce a smoothed result. In some countries, sample registration systems are operated wherein events are recorded in detail for a representative sample of communities within those countries. We used the same death distribution methods to evaluate the completeness of these sources as for VR; sample registration death counts were scaled in the death distribution methods analysis to the national level. This study considers a country to have complete VR when it used a civil registration system, vital statistics, or sample registration system that captures at least 95% of all deaths within the country. When calculating death rates for under-5 mortality, adult mortality, or empirical life tables, we used the GBD population estimates by age, sex, location, and year as the denominator.[31]

In addition to VR data, for the estimation of under-5 death rates, we use data from complete birth histories collected through household survey programmes, including the World Fertility Survey, Demographic and Health Surveys, some Multiple Indicator Cluster Surveys, and various other national surveys. A wider set of surveys and many censuses also collect data on the number of livebirths for a woman and the number of these children who are still surviving. This information is called a summary birth history and can yield an unbiased assessment of the trend in the under-5 death rate.[39]

See Online for appendix 2

Assessments of adult mortality, in addition to VR and sample registration data, use survey data collected on sibling histories. A sibling history means that a respondent is asked to report on the survival or death of each of their siblings; in other words, the respondent provides a complete birth history for their mother. Sibling histories are subject to survivor bias and recall bias. Sibling history data are processed for GBD using methods that address these limitations.[40] Some surveys and some censuses also use information on deaths in a household over some recent time interval—for example, the past 12 months. Studies suggest that respondents can over-report or under-report deaths of household members.[41] We apply death distribution methods to assess completeness, which can be greater than 100% due to telescoping of event reporting, which happens when a respondent reports an event that happened before the recall period as if it happened during the recall period.

For GBD 2017, we also included DSS data on adult mortality for the first time, specifically on the probability of death between the ages of 15 and 60 years (45q15), from local communities that are under direct surveillance. Because these DSS communities are not nationally representative, we adjusted the level of 45q15 based on the ratio of the probability of death from birth to age 5 years (5q0) from the DSS to the national 5q0, taking into account that the relationship between 5q0 and 45q15 changes as the level of 5q0 declines because, on average, there are larger declines in 5q0 than in 45q15 over time.

New data for GBD 2017 compared to GBD 2016

In GBD 2017, we have added 458 location-years of VR data at the national level and 9 location-years of VR data at the subnational level compared with GBD 2016. We also included an additional 62 complete birth history sources at the national level, 12 complete birth history sources at the subnational level, 72 national summary birth history sources, and 16 subnational summary birth history data sources. 11 national and seven subnational sibling history surveys were also added. We included 1529 datapoints from DSSs in 15 countries. The total numbers of datapoints used were 181 625 for under-5 mortality estimation and 63 234 for adult mortality estimation. We also used 35 177 empirical life tables in the all-cause mortality database for GBD 2017. Appendix 1 provides complete lists of data availability and data sources by location; these are also available using our online source tool, the Global Health Data Exchange. The addition of these data has provided increasingly accurate mortality metrics in many countries over all years estimated in GBD.

For the **Global Health Data Exchange** see http://ghdx.healthdata.org/

Estimating under-5 mortality and more detailed age intervals below 5 years

Using all the VR, complete birth history, and summary birth history data available for each country, we estimate the time trends from 1950 to 2017 for each location. We use spatiotemporal Gaussian process regression (ST-GPR) to estimate time trends. This model has four components. First, it includes three covariates: lag-distributed income (LDI) per capita, average years of schooling for women aged 15–49 years, and the crude rate of death from HIV/AIDS.[42–44] Second, it includes random effects for each source of data in each country, where a source refers to a particular survey or census. Using the random effects, data are adjusted to the reference source for each country. The reference source is VR in countries with complete VR and complete birth histories in countries without complete VR. In some locations, reference sources are selected on the basis of expert knowledge of a country and its data sources provided by GBD collaborators. The third component of the model borrows strength over space and time by smoothing the residuals; the degree of smoothing is controlled by three hyperparameters. These hyperparameters are a time weight (lambda), a space weight (zeta), and a temporal correlation weight (scale). Additional details on the selection of the hyperparameters are included in appendix 1 section 2.2. The fourth component of the model uses the output after the first three components have been run as the mean prior in a Gaussian process regression. Gaussian process regression also includes four hyperparameters, lambda, zeta, scale, and an additional hyperparameter, amplitude. Details on these hyperparameters are included in appendix 1. In GBD 2017, to standardise our analysis further, we have opted to use the same amplitude for all locations. The value for amplitude is based on the analysis of variation over time in countries with complete VR that is not explained by the covariates.

We use a multiphase approach to generate age-specific and age-sex-specific under-5 mortality. We first model the ratio of male to female 5q0. Next, we run separate models to estimate the probability of death for each sex and age group, specifically early neonatal (0–6 days), late neonatal (7–27 days), postneonatal (28–364 days), infant mortality (<1 year), and childhood mortality (between 1 and 5 years). These are run to take advantage of greater data density for both the ratio of male to female mortality and the split between infant mortality and childhood mortality as compared with the split of infant mortality into the components of early neonatal, late neonatal, and postneonatal. Each is modelled using ST-GPR. Results of the sex-ratio model are first applied to derive sex-specific under-5 death rates (U5MR). Next, the probability of death from birth to the exact age of 1 year and from age 1 year to the exact age of 5 years are transformed to conditional probabilities and scaled to the sex-specific U5MR estimates. This is done to ensure that the value of 1 minus the probabilities from birth to the exact age of 1 year and from age 1 year to the exact age of 5 years equals the probability of death between birth and the exact age of 5 years. Lastly, early neonatal, late neonatal, and postneonatal model results are transformed to conditional probabilities and scaled in the same manner to equal the sex-specific probability of death from birth to the exact age of 1 year. More information on the models, model hyperparameters, and scaling can be found in appendix 1 section 2.2.

Estimating the probability of death between ages 15 and 60 years

Data on the probability of death between the ages of 15 and 60 years are also modelled using ST-GPR. In the first stage model, we use LDI per capita, average years of schooling for the population aged 15–59 years, the crude rate of death from HIV/AIDS, and the under-5 mortality rate as covariates.[42–44] Under-5 mortality rate was not used as a covariate in GBD 2016, but we found that the model, which is now estimating for a longer time period going back to 1950, performs better when this covariate is included. We model the data for males and females together and include a dummy variable for sex in the model. In GBD 2016, we had run separate models for males and females, but this had yielded implausible sex ratios of adult mortality rates in specific location-years. More details, including hyperparameters for the ST-GPR model, are described in appendix 1 section 2.3.

GBD model life table system and the database of empirical life tables

To produce a complete set of age-specific mortality rates (an abridged life table) for each location, we used the GBD model life table system, which identifies a reference life table for each location, year, and sex, on the basis of the nearest matches found in our empirical life table database.[14] As we have revised the population denominators used to create the empirical life tables in GBD 2017, we have substantially updated and revised the database of empirical life tables as well. In previous GBD iterations, we excluded life tables based on implausible patterns of variation in death rates in the age groups older than 40 years. As with previous GBD cycles, we have two sets of life tables that meet inclusion criteria: a universal set that is used for all locations to identify matches and a location-specific set that is used for each location along with the universal set. We have formalised the inclusion criteria for life tables for both the location-specific and the universal set, and those are listed in section 2.4 of appendix 1. Life tables that meet all of the general inclusion criteria but not all of the universal life table inclusion criteria are categorised as location-specific life tables. For each life table, within each location, we sort life tables by year and generate smoothed life tables using moving averages of widths 3, 5, and 7 adjacent years within each location. This smoothing helps to address jumps or drops in age-specific mortality in locations where small numbers of deaths resulted in high variability of mortality patterns across age. After separately categorising each life table, we keep the least-smoothed of the candidate life tables within each life table set. The smoothing process and inclusion criteria help to address implausible age patterns from countries with small populations, unstable death rates, or poor data quality.

We have also set the number of matches searched for in the databases to be 100 for all locations; to ensure that locations with high-quality data primarily rely on their own age patterns of mortality, we have modified the space-time weighting scheme through a 25-fold increase in the country-specific weights compared with GBD 2016, with an additional 15-fold increase in 0-year and 1-year lag country-specific weights and a three-fold increase in the 2-year, 3-year, and 4-year lag country-specific weights. We also generated a new geographical strata of life table weights for subnational locations that are within the same country, which were assigned the same value as the original GBD 2016 country-specific weights.

For both all-cause mortality and cause-specific mortality analyses in GBD, we amassed a comprehensive database on human mortality from full VR systems and sample VR systems such as the Sample Registration System (SRS) from India and the Disease Surveillance Point system from China. These data sources provided a total of 42 138 empirical life tables, which also include subnational locations. After applying inclusion criteria, we use 35 177 life tables, of which 10 885 are universal and 24 292 location-specific. The GBD model life tables varied in quality in accordance with the coverage of a location's VR: for locations where VR coverage was high, the standard was overwhelmingly derived from observed mortality patterns, whereas in locations where VR coverage was low, the standard was based on locations with similar under-5 and adult mortality rates, with more weight given to life tables that were closer geographically and temporally. The selection of geographically and temporally similar locations helped to capture differences in mortality patterns by age due to specific causes of death.

Single-year life tables

To support the estimation of single-year population for each location-age-sex-year, we have also generated single-year life tables for all locations from the abridged life tables after the HIV/AIDS mortality reconcilliation process and the addition of fatal discontinuities. Our method for generating single-year probabilities of death that are consistent with the abridged life table probabilities of death and known data on single-year patterns is described in the GBD 2017 population and fertility publication.[31]

Fatal discontinuities

Fatal discontinuities are idiosyncratic increases in mortality that would affect long-term mortality trends if modelled using the all-cause mortality estimation process, and as a result, are estimated separately. Events categorised as fatal discontinuities are epidemics (such as Ebola virus disease or cholera); natural disasters, major technological or transport accidents, and war and terrorism. The specific data sources used to compile fatal discontinuities can be explored using the online source tool, the Global Health Data Exchange, and are described in detail in appendix 1

***Figure 1:* Estimated proportion of deaths that are registered and reported globally and by GBD super-region, for both sexes combined, 1950–2016**

Each line represents the proportion of deaths that are registered and reported for a given GBD super-region or globally from 1950 to 2016. The reason for the dips in the most recent years is that lags in reporting mean that estimated deaths are higher than what is reported, resulting in a huge drop in completeness from 2015, where the reported deaths are more complete. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study.

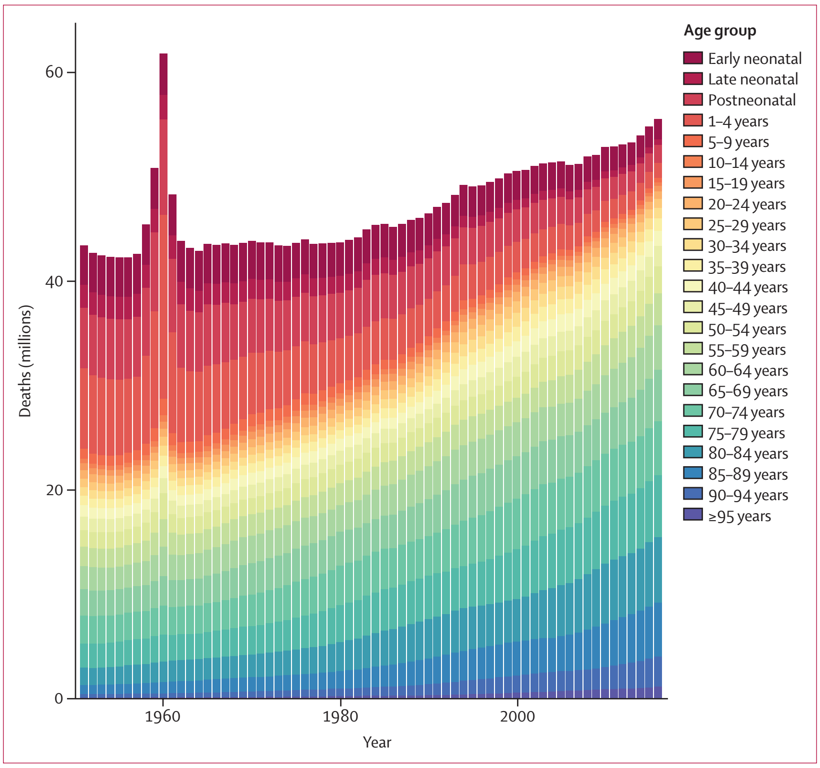


Figure 2: **Total number of deaths by age, globally, for both sexes combined, 1950–2017**
Each stacked bar represents the total number of deaths in the given year attributable to each age group, from 1950 to 2017, for both sexes combined. The early neonatal age group is 0–6 days, late neonatal is 7–27 days, and postneonatal 28–364 days.

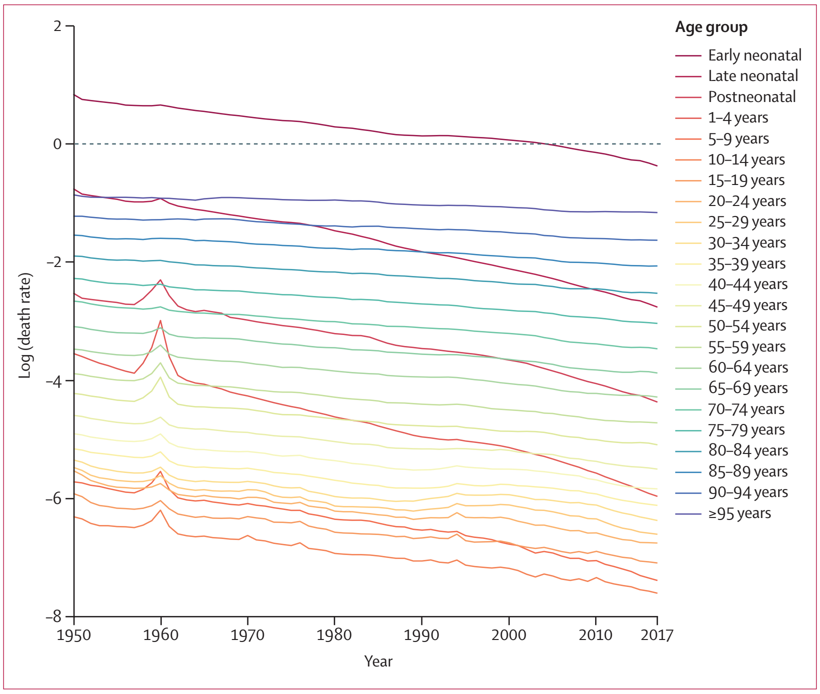


Figure 3: **Natural logarithm of age-specific mortality rates, globally, for both sexes combined, 1950–2017**
Each line represents the natural logarithm of the global death rate for a single year by age group, from 1950 to 2017, for both sexes combined. The early neonatal age group is 0–6 days, late neonatal is 7–27 days, and postneonatal 28–364 days.

section 4. Estimates from high-quality VR systems were included instead of estimates from other sources in the event that conflicting sources were identified for a fatal discontinuity, with few exceptions when there was evidence to suggest that the VR system was compromised by the event. Regional, cause-specific UIs were used to estimate uncertainty for events where only point-estimate mortality data were available.

For GBD 2017, we have recoded the locations of all events using a new suite of software developed in-house to match differently coded locations in the fatal discontinuities database to GBD locations, taking advantage of detailed location information that was presented in non-standardised ways—eg, sources that included the name of a city or village instead of latitude and longitude. We first overlaid the portions of the database with latitude-longitude coordinates to the most detailed GBD location. When coordinates were not available, we used three web-based geocoding services—the Google Maps, OpenStreetMap, and Geonames geocoding application programming interfaces—to get a set of possible latitude and longitude coordinates from the location, overlaid those coordinates on to GBD locations, and then used the most common result from the three services to assign a GBD location.

Since discontinuities for recent years are not well tracked in the available databases, we have supplemented these databases with online searches. For GBD 2017, we systematised the identification of events missing from our database by mining Twitter accounts of major news providers for common terms associated with such events, like “earthquake” and “casualties.” This provided 62 events. Once events were identified, news reports of death totals, location, and date were used.

The age pattern of deaths is rarely identified in databases of fatal discontinuities. In order to estimate an age and sex distribution, events were first assigned to a GBD cause. Events were then split based on both the global age and sex distribution of that cause of death and the age and sex distribution of the population in the GBD location of the event, following the GBD causes of death age-sex-splitting algorithm. The main effect of this effort is that we are much less likely to miss shocks or allocate them to the wrong subnational location.

HIV/AIDS in countries with large epidemics and incomplete VR

We produced estimates of adult HIV/AIDS incidence and prevalence using the estimation and projection package (EPP), a Bayesian model developed by UNAIDS.[45] Our implementation of EPP made use of GBD-estimated demographic parameters, mortality rates for people on and off antiretroviral therapy, and CD4 progression rates to fit a model to HIV/AIDS prevalence data from surveillance sites and representative surveys. EPP-generated incidence and prevalence time series were used as inputs into Spectrum, a compartmental

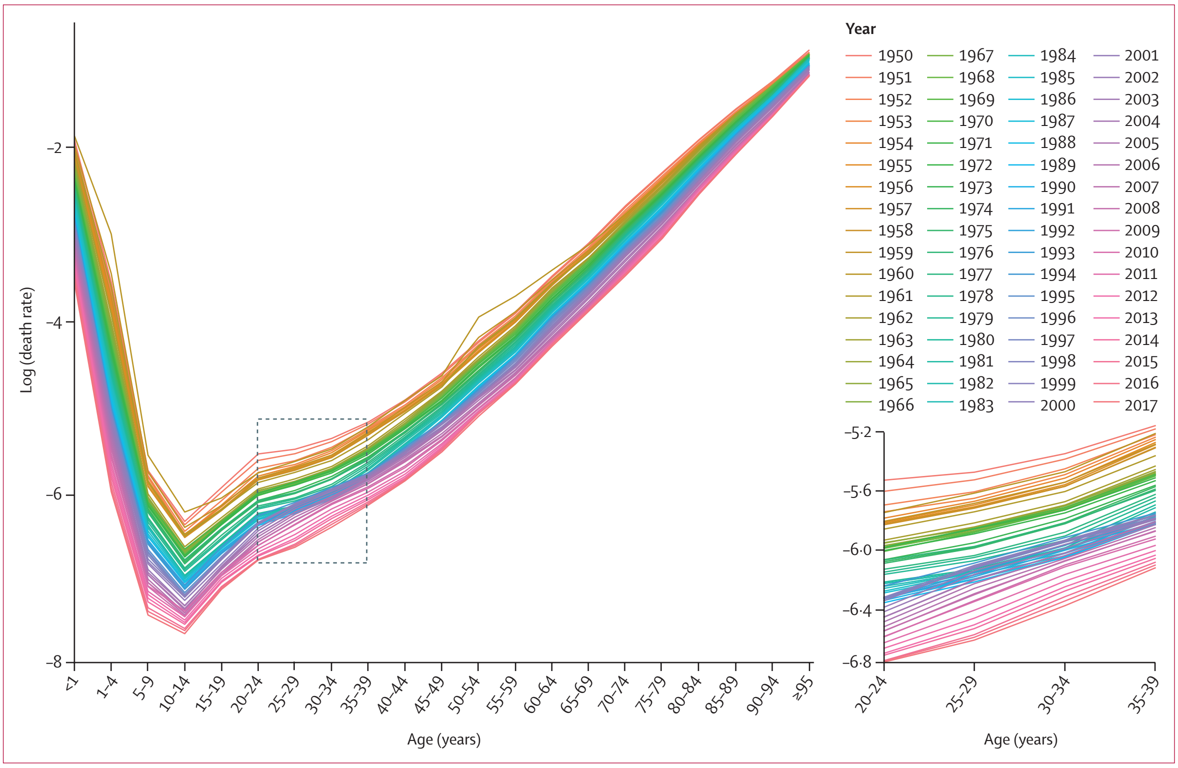


Figure 4: **Global log (death rate) age-pattern for both sexes combined, by year, 1950–2017**
Each line represents the logarithm of global age-specific mortality rates for a given year between 1950 and 2017 and for both sexes combined. The inset shows a closer view of age groups from 20 to 39 years.

HIV/AIDS progression model originally developed by UNAIDS. Spectrum generated a full set of age-sex-specific HIV/AIDS mortality rates using detailed demographic parameters that align with those used for EPP. In countries with VR data, we adjusted age-specific and sex-specific incidence rates to produce mortality estimates that better fit observed deaths. In parallel, the GBD model life table process produced a separate set of HIV/AIDS death estimates, which were reconciled with Spectrum outputs to produce final mortality estimates. For countries with high-quality VR systems, mortality estimates were generated using ST-GPR on VR data.

Analysing the relationship between age-specific mortality rates and development status

To characterise development status, we used the Socio-demographic Index (SDI), a composite measure based on the total fertility under the age of 25 years (TFU25), average educational attainment in those aged 15 years or older, and LDI. Compared with GBD 2016, the SDI calculation in GBD 2017 has been refined to use TFU25 instead of the total fertility rate because TFU25 does not show a U-shaped pattern with development at higher levels of development status and is a better proxy for the status of women in society.[31] Aggregate SDI groupings were generated by applying quintile cutoffs from the distribution of national-level SDI for countries with populations greater than 1 million in 2017 to estimates of SDI for all GBD locations in 2017. The SDI analysis is described in further detail in appendix 1 (section 3); additional detail on correlation for the weighted scores is also provided.

To evaluate the average relationship between SDI and all-cause mortality, we fit a generalised additive model with a Loess smoother on SDI by age and sex group using GBD 2017 estimates from 1950 to 2017. The expected value is based solely on SDI status and does not vary over time. Examination of how the ratio of observed death rates to expected death rates changes over time allows us to explore the impact of how the relationships are changing over time. The expected age-sex-specific mortality rates were subsequently used to generate a complete life table expected on the basis of SDI alone.

Uncertainty analysis

We estimate uncertainty systematically throughout the all-cause mortality estimation process. We generated 1000 draws for each all-cause mortality metric, and 95% UIs are calculated using the 2·5th and 97·5th percentiles of the draw-level values. Analytical steps are connected at the draw level, and the uncertainty of key mortality metrics is propagated throughout the all-cause mortality estimation process. Uncertainty in under-5 mortality and adult mortality rate estimation

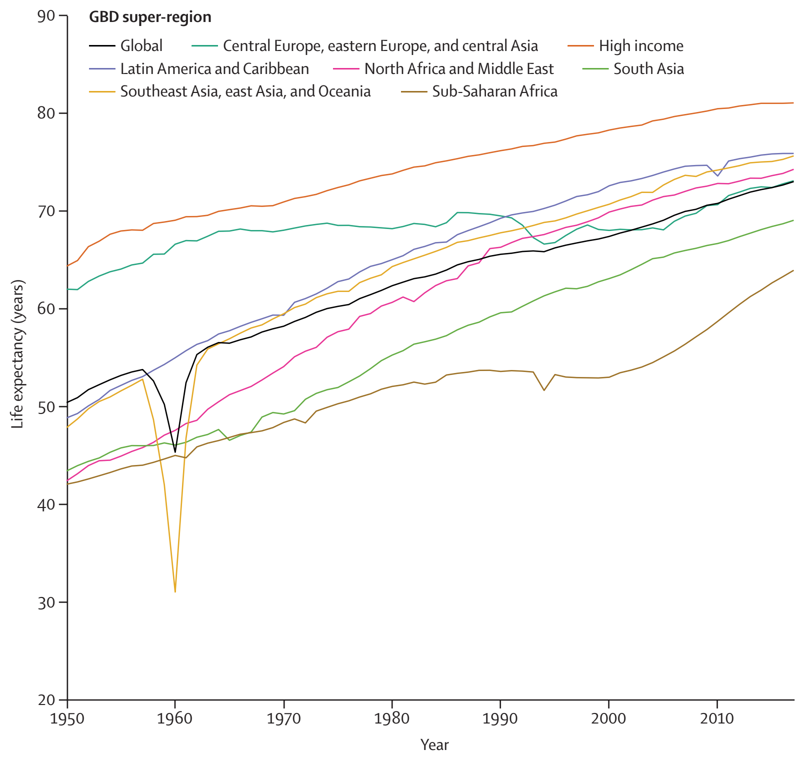


Figure 5: **Life expectancy at birth and by GBD super-region for both sexes combined, 1950–2017**
GBD=Global Burden of Diseases, Injuries, and Risk Factors Study.

and completeness synthesis are estimated using non-sampling error and sampling error by data source. For the model life table step and HIV/AIDS-specific mortality calculations, uncertainty was estimated from uncertainty in the life table standard and from the regression parameters and sampling error in the EPP, respectively.

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. All authors had full access to the data in the study and had final responsibility for the decision to submit for publication.

Results

Levels and trends in death registration

The proportion of deaths that are registered and reported through VR and civil registration systems globally and by super-region are shown in figure 1, with detailed information on each location shown in appendix 1. The updated results of the application of all three death distribution methods and the synthesised time series of completeness are available online. Globally, 18·7% (95% UI 18·4–19·0) of deaths were registered in 1950 and that number has been steadily increasing, with 58·8% (58·2–59·3) of all deaths registered in 2015, the most recent year with the highest reported rate. 2015 is the peak year of completeness of death registration and reporting

For more on the **application of death distribution methods and synthesised time series of completeness** see https://vizhub.healthdata.org/mortality/

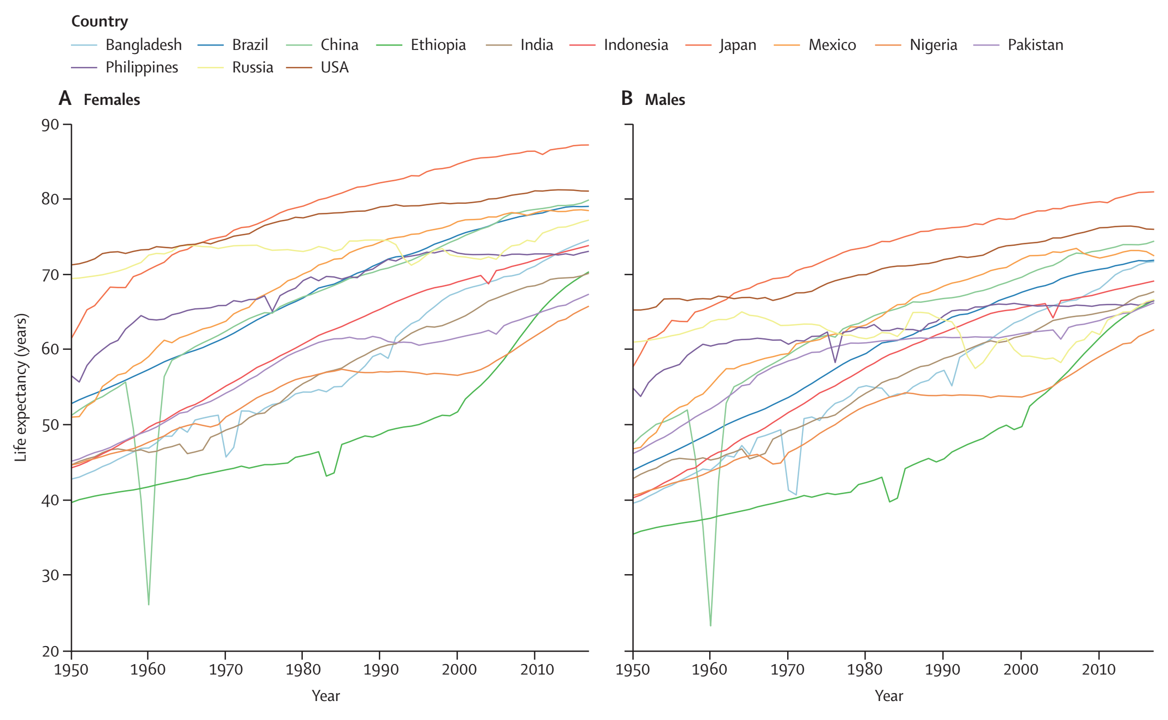
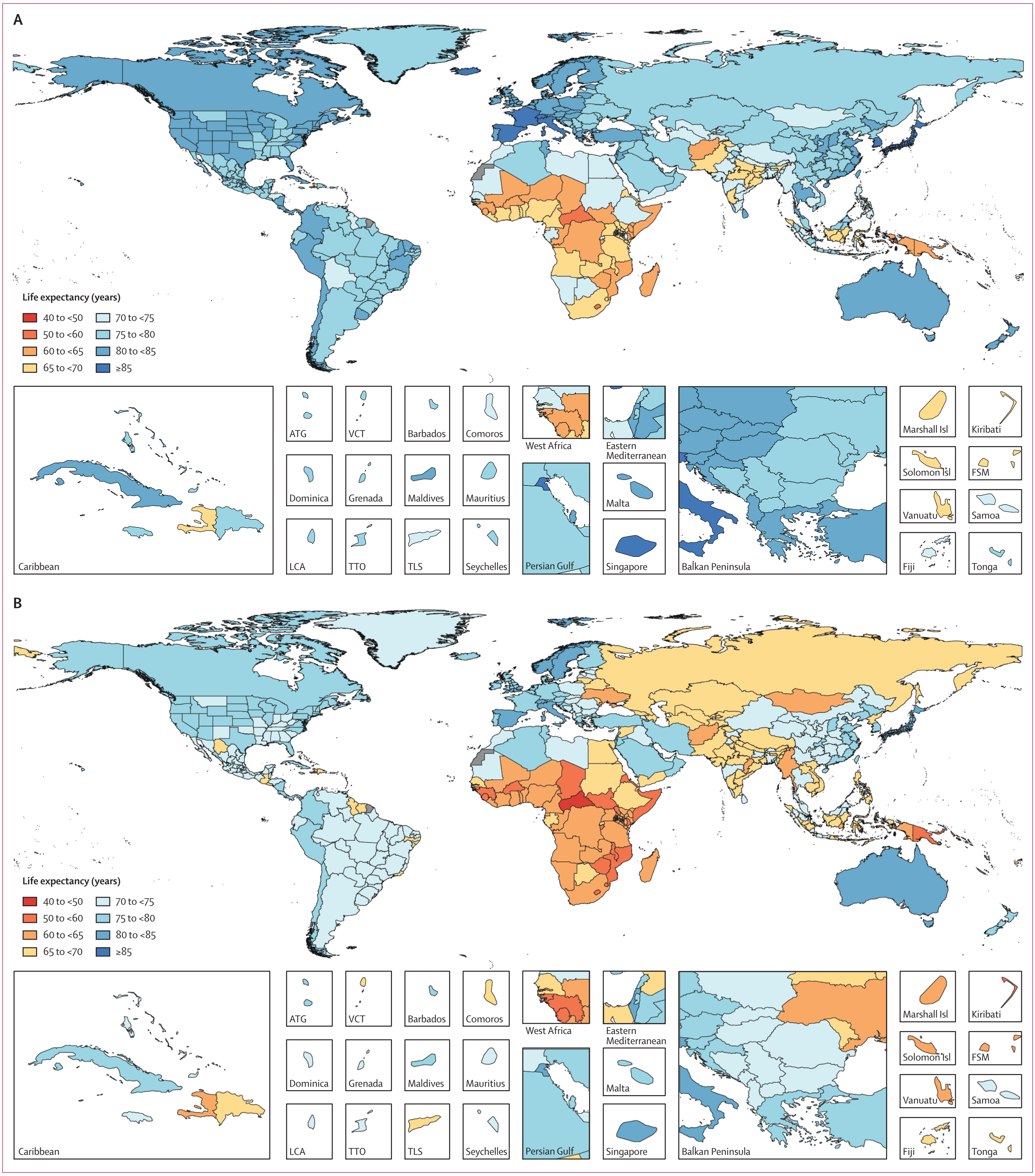
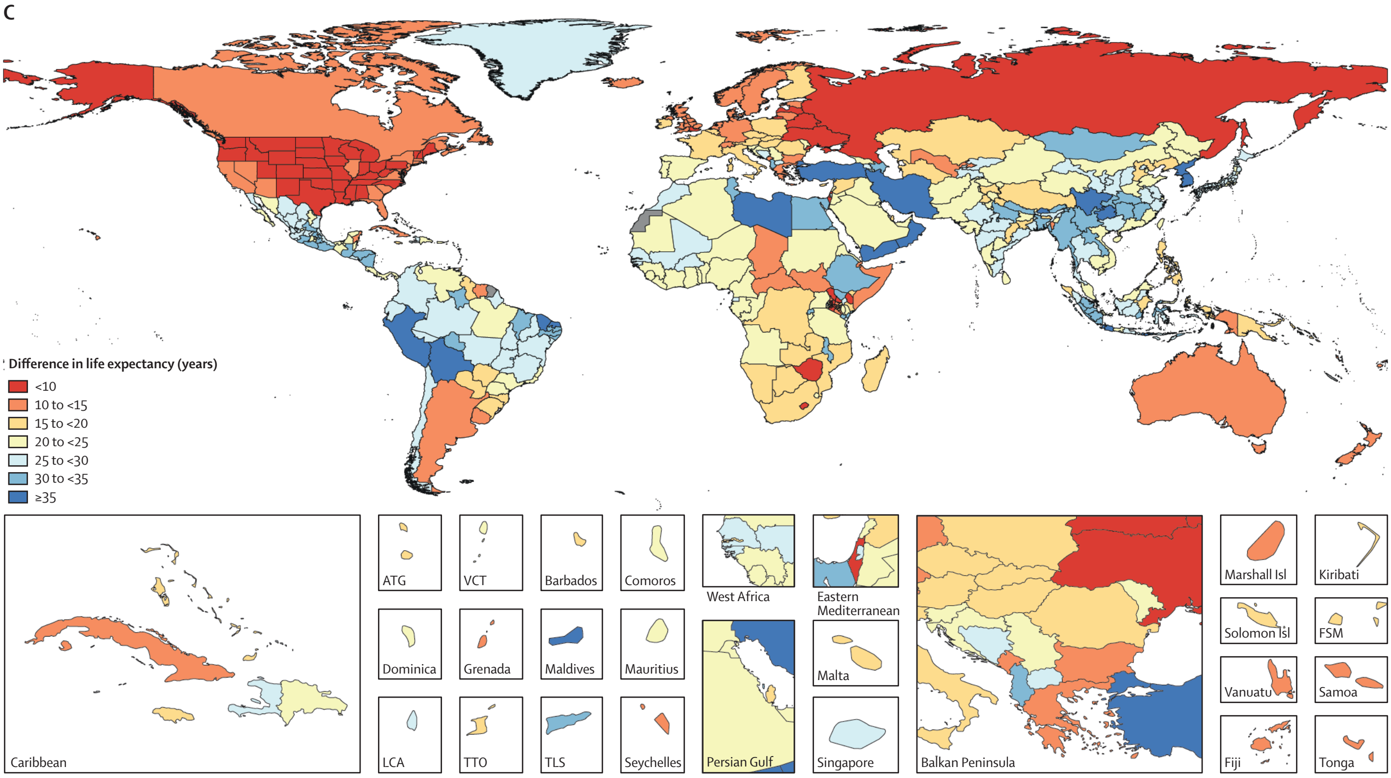


Figure 6: **Life expectancy at birth for the countries with population greater than 100 million, 2017**
Each line represents life expectancy at birth from 1950 to 2017 for females (A) and males (B).

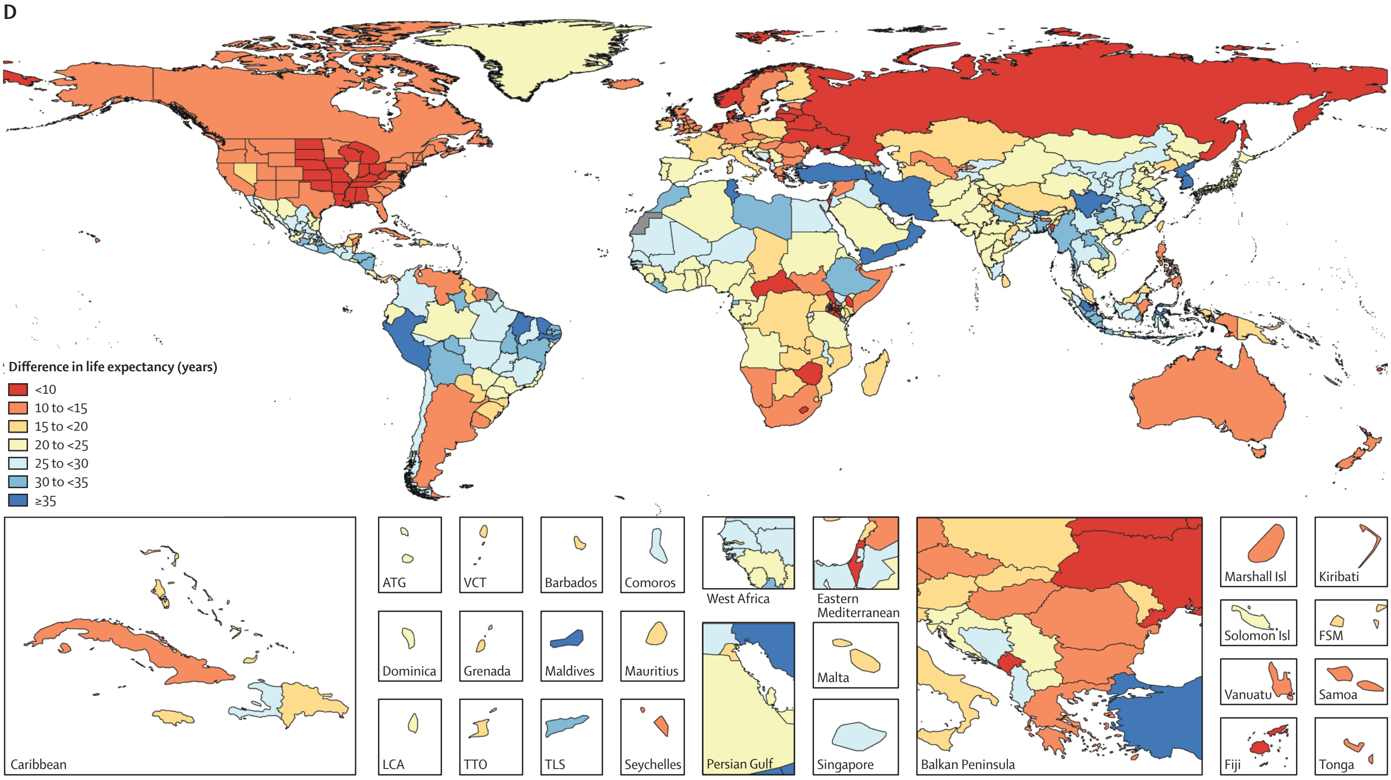


(Figure 7 continues on next page)

C


Difference in life expectancy (years)
<10
10 to <15
15 to <20
20 to <25
25 to <30
30 to <35
≥35
Caribbean
ATG
VCT
Barbados
Comoros
West Africa
Eastern Mediterranean
Balkan Peninsula
Marshall Isl
Kiribati
Dominica
Grenada
Maldives
Mauritius
Malta
Solomon Isl
FSM
Vanuatu
Samoa
LCA
TTO
TLS
Seychelles
Persian Gulf
Singapore
Fiji
Tonga

D


Difference in life expectancy (years)
<10
10 to <15
15 to <20
20 to <25
25 to <30
30 to <35
≥35
Caribbean
ATG
VCT
Barbados
Comoros
West Africa
Eastern Mediterranean
Balkan Peninsula
Marshall Isl
Kiribati
Dominica
Grenada
Maldives
Mauritius
Malta
Solomon Isl
FSM
Vanuatu
Samoa
LCA
TTO
TLS
Seychelles
Persian Gulf
Singapore
Fiji
Tonga

globally, which partly reflects the substantial lag between when deaths occur and when they get reported through existing systems. Two super-regions, the high-income countries and central Europe, eastern Europe, and central Asia have had complete registration since 1985, with completeness considered to be above 95%. The Latin America and the Caribbean region has also had high registration since the late 1970s, which has been increasing and reached a high of 88·5% (88·0–89·0) in 2011 and staying around that level since. Substantial progress was seen in southeast Asia, east Asia, and Oceania in the past decade, with registration having increased from less than 10% as recently as 2006, to 49·6% (48·7–50·6) in 2015. South Asia and north Africa and the Middle East had improvements throughout this time period; south Asia reached a maximum completeness of 69·4% (68·4–70·5) in 2007 and was at 51·1% in both 2013 and 2014, and north Africa and the Middle East attained a 57·7% (56·5–58·9) completeness in 2015. Globally, 134 of 195 countries and territories had increases in completeness since the first year for which we have reported VR. Notable increases were for Iran, which increased from 13·4% (13·1–13·8) in 1974 to 89·8% (89·4–90·1) in 2016, Turkey, which increased from 28·9% (27·5–30·5) in 1978 to 100% (100–100) in 2016, and South Korea, which was 39·0% (35·0–43·2) in 1957 and increased to 97·9% (94·5–100·0) in 2016. Despite the increases over time, figure 1 also shows that 62·2% of all deaths did not get reported or registered as recently as 2016. Sub-Saharan Africa stands out as the region with the lowest rate of death registration and reporting. While substantial progress has been made in all other super-regions, sub-Saharan Africa remains at very low levels of death reporting and registration. 56 countries had registration that was complete or at its highest level in 2016. In other countries, the lag between registration and reporting is even longer; only 81 countries were regarded as having complete registration (>95%) for at least 1 year in the past 5 years, which were mainly in western Europe, central Europe, and the Caribbean.

Trends in number of age-specific deaths and death rates at the global level since 1950

Figure 2 shows the total number of deaths over time by age and for both sexes combined (sex-specific results are available in appendix 2). There were 43·7 million (95% UI 43·0–44·3) deaths in the world in 1950, and that number had increased to 55·9 million (55·4–56·5) by 2017. This relatively small increase of 28·1% (25·9–30·4) in the total number of global deaths is even more impressive when taken in the context of population growth. Despite the huge increase in the global population, from 2·57 billion (2·52–2·62) in 1950 to 7·64 billion (7·39–7·87) in 2017—increase of 297·2% (293·6–299·9)—the number of deaths has remained comparatively constant. The highest number of deaths, 61·8 million (61·4–62·3), occurred in 1960. The excess number of deaths in 1960 compared with adjacent years was due to the Great Leap Forward in China. Overall, for both men and women (figures by sex shown in appendix 2), there has been a huge decrease in childhood deaths across all of the four age groups that refer to under-5 mortality (figure 2). As a proportion of total deaths, deaths before the age of 5 years have decreased from 44·9% (44·2–45·7) in 1950 to 9·6% (9·3–10·0) in 2017. Conversely, deaths at ages older than 75 years have increased substantially, going from 11·9% (11·8–11·9) of total deaths in 1950 to 39·2% (39·1–39·4) of total deaths in 2017.

The trends in age-specific deaths during this time period are shown in more detail in appendix 2. Broadly, the trends over time in the number of deaths fall into three categories, aside from the large spike in deaths in 1960 due to the Great Leap Forward in China. First, the age groups younger than 5 years have had consistent declines in the numbers of deaths since 1950. The largest declines were in the four age groups pertaining to ages younger than 5 years for both boys and girls. Globally, for both sexes combined between 1950 and 2017, the number of deaths declined in the early neonatal period from 3·7 million (95% UI 3·6–4·0) to 1·9 million (1·8–1·9); in the late neonatal period from 2·2 million (2·1–2·3) to 0·5 million (0·5–0·5); in the postneonatal period from 5·8 million (5·6–6·1) to 1·6 million (1·6–1·7); and at ages 1–4 years from 7·8 million (7·6–8·1) to 1·4 million (1·3–1·5). This substantial decline in the total number of under-5 deaths, from 19·6 million (19·1–20·2) to 5·4 million (5·2–5·6), also needs to be considered in the context of the number of births, which has increased by 49·9% (43·5–56·5) from 92·6 million (88·9–96·4) to 138·8 million (130·0–149·1) during the same period. Second are the age groups starting at age 5 years and up to age 49 years, for which the numbers of deaths have remained relatively constant between 1950 and 2017. For example, for the 20–24 years age group there were 892 000 (879 000–909 000) deaths in 1950 and 710 000 (697 000–725 000) in 2017. Third, in the older age groups (ie, those older than 50 years), the number of deaths has steadily increased since 1950; these increases are most notable in the age groups older than 80 years.

Figure 3 shows depicts the trends in age-specific death rates since 1950 on a natural log scale. Death rates in the younger age groups, especially those younger than 5 years, have declined faster than those in adult age groups for both men and women. For some age groups, particularly those older than 80 years, death rates have not changed much over the past 68 years, suggesting that

Figure 7: Life expectancy at birth, by location, for females (A) and males (B), 2017, and difference in life expectancy at birth, by location, for females (C) and males (D) between 2017 and 1950

ATG=Antigua and Barbuda. FSM=Federated States of Micronesia. LCA=Saint Lucia. TLS=Timor-Leste. TTO=Trinidad and Tobago. VCT=Saint Vincent and the Grenadines.

the large increase in the absolute number of deaths shown in figure 2 is driven by increases in the populations of those age groups over time, and not by increases in age-specific death rates.

Figure 4 shows the age-specific mortality rate curves for all years since 1950. On a natural log scale, the same difference on the y-axis represents the same percentage decline. This representation highlights the remarkable progress in age-specific mortality rates over time. The exception here is the period between 1958 and 1961, which reflects the impact of the Great Leap Forward in China, seen as higher mortality rates for all age groups under the age of 15 years and higher mortality rates than other years for ages 50–64 years. Outside of that period, the younger age groups that compose under-5 mortality have steady progress over time, with the mortality rate for 1–4 year olds dropping from 2554·7 deaths (95% UI 2330·7–2788·5) per 100 000 to 264·7 (239·6–293·3) between 1950 and 2017. What is less visible in the previous figures is the steady progress in the age groups 5–9 years and 10–14 years, for which mortality rates have dropped from 330·4 (325·9–335·4) per 100 000 to 62·3 (61·2–63·5) per 100 000 and 183·4 (181·3–186·0) per 100 000 to 50·3 (49·5–51·1) per 100 000, respectively. Progress in age-specific mortality rates occurred across all ages, but become less pronounced for the older age groups. Despite overall progress, in the younger adult age groups (ages 20–45 years) the curves from the early 2000s cross over those for the 1990s, indicating a reversal in decades of progress on young adult mortality (see insert in figure 4). Other than this period of reversal at the global level, progress has been remarkably consistent in global death rates, albeit with very different relative changes by age group.

Global, regional, and national trends in life expectancy since 1950

Taking into account trends in age-specific mortality rates over time, figure 5 shows global and regional trends for both sexes combined in life expectancy at birth since 1950 (sex-specific figures are available in appendix 2). Globally, life expectancy at birth has increased from 48·1 years (95% UI 46·5–49·6) in 1950 to 70·5 years (70·1–70·8) in 2017 for men and from 52·9 years (51·7–54·0) in 1950 to 75·6 years (75·3–75·9) in 2017 for women. The huge impact of the Great Leap Forward in China in 1960 is shown clearly at both the global and regional level. Globally, life expectancy dropped by 5·1 years (3·9–6·2) as a result of the famine. Other than this massive fatal discontinuity, the trend in life expectancy at the global level has been one of steady increases. The smallest gain at the global level was during the 1990s and is partly explained by the fact that two super-regions, central Europe, eastern Europe, and central Asia, and sub-Saharan Africa, experienced declines during this decade. At the super-region level, the largest gains in life expectancy since 1950 were in north Africa and the Middle East, where life expectancy increased from 42·4 years (40·6–44·1) to 74·2 years (73·9–74·6). At the other end of the scale, the smallest net gains in life expectancy were in central Europe, eastern Europe, and central Asia, where life expectancy has increased by a total of only 11·1 years (10·3–11·9) since 1950, including periods where life expectancy decreased. Progress has been made in this super-region since 2000, with increases of 5·6 years (5·4–5·8) for men and 4·2 years (4·1–4·4) for women in life expectancy up to 2017.

Sub-Saharan Africa had the lowest levels of life expectancy in 2017, at 63·9 years (95% UI 63·1–64·6) for both sexes combined, which is where the global average was in the mid-1980s. Although the net increase during the 68-year period since 1950 has been the smallest for sub-Saharan Africa, with declines occurring during the 1990s for both men and women, the region has also shown the greatest gains in life expectancy since 2000. Life expectancy has increased by 10·9 years (10·1–11·7) since 2000, a much faster rate of increase than in previous decades. High-income regions had the highest life expectancy in 2017; however, the gains since 2010 have been very small at 0·6 years (0·5–0·7).

Figure 6 shows changes in life expectancy at birth for women (figure 6A) and men (figure 6B) for the 13 countries with a population greater than 100 million in 2017, which jointly represent 62·5% (95% UI 61·5–63·4) of the global population. Among these 13 countries, Russia stands out for having the smallest net gain over the 68-year period of the study at only 5·7 years (4·8–6·7) for men and 7·7 years (7·0—8·6) for women. Men in Ethiopia and Pakistan have similar life expectancies to men in Russia in 2017 at 66·7 years (65·6–67·7) and 66·4 years (63·8–69·1), respectively; however, men in both Ethiopia and Pakistan have had significant increases in life expectancy since 1950, adding up to a total gain of 31·1 years (28·0–34·3) in Ethiopia and 20·1 years (16·1–23·9) in Pakistan, with particularly pronounced increases since 2000 for Ethiopia. While not as noticeable as for men, gains in life expectancy have also been small for women in Russia, with the most pronounced declines seen in the early 1990s. Furthermore, whereas Russia was ranked second among this group of countries in both men and women in 1950, following the USA, by 2017, it had fallen to tenth place for men and sixth place for women.

The largest gains in life expectancy among the 13 most populous countries were in Bangladesh (32·1 years [95% UI 29·3 to 35·2] for men and 31·7 years [28·4 to 35·0] for women) and Ethiopia (31·1 years [28·0 to 34·3] for men and 30·6 years [28·3 to 32·9] for women). The Philippines stands out as the country in this group in which the gap between female and male life expectancy has grown the most since 1950. The gap was only 1·6 years (–0·1 to 3·3) in 1950 and has grown to 6·5 years (3·6 to 9·1) in 2017. In 1950, life expectancy in the Philippines was only

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Global	**0·04 (0·04 to 0·05)**	**0·04 (0·03 to 0·04)**	**0·17 (0·17 to 0·17)**	**0·10 (0·10 to 0·11)**	**70·48 (70·12 to 70·82)**	**75·59 (75·31 to 75·86)**	**19·39 (19·28 to 19·51)**	**22·61 (22·5 to 22·73)**	**30 387 (29 986 to 30 775)**	**25 558 (25 224 to 25 885)**
Low SDI	0·07 (0·06 to 0·08)	0·06 (0·06 to 0·07)	0·24 (0·23 to 0·25)	0·18 (0·18 to 0·19)	64·48 (63·8 to 65·13)	67·34 (66·75 to 67·95)	16·77 (16·5 to 17·04)	18·15 (17·84 to 18·45)	4806 (4685 to 4939)	4131 (4023 to 4240)
Low-middle SDI	0·06 (0·05 to 0·06)	0·05 (0·05 to 0·05)	0·22 (0·21 to 0·23)	0·16 (0·15 to 0·17)	66·27 (65·67 to 66·86)	70·08 (69·5 to 70·65)	17·28 (17·02 to 17·53)	19·4 (19·11 to 19·69)	6579 (6363 to 6813)	5656 (5465 to 5866)
Middle SDI	0·02 (0·02 to 0·02)	0·02 (0·02 to 0·02)	0·17 (0·16 to 0·17)	0·09 (0·09 to 0·09)	71·71 (71·37 to 72·09)	77·42 (77·09 to 77·7)	18·92 (18·69 to 19·18)	22·22 (21·96 to 22·46)	6067 (5911 to 6217)	4536 (4418 to 4662)
High-middle SDI	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·15 (0·14 to 0·15)	0·07 (0·07 to 0·07)	73·33 (72·98 to 73·69)	79·42 (79·13 to 79·7)	19·1 (18·85 to 19·37)	22·68 (22·44 to 22·91)	7831 (7607 to 8059)	6259 (6088 to 6439)
High SDI	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·10 (0·10 to 0·10)	0·05 (0·05 to 0·06)	78·47 (78·3 to 78·65)	83·7 (83·53 to 83·86)	22·46 (22·33 to 22·58)	26·19 (26·05 to 26·32)	4997 (4922 to 5071)	4875 (4797 to 4953)
Central Europe, eastern Europe, and central Asia	**0·02 (0·01 to 0·02)**	**0·01 (0·01 to 0·01)**	**0·24 (0·24 to 0·25)**	**0·10 (0·10 to 0·10)**	**68·5 (68·3 to 68·68)**	**77·57 (77·41 to 77·74)**	**17·02 (16·92 to 17·12)**	**21·99 (21·89 to 22·1)**	**2427 (2398 to 2457)**	**2303 (2273 to 2332)**
Central Asia	0·03 (0·03 to 0·03)	0·02 (0·02 to 0·03)	0·22 (0·21 to 0·23)	0·11 (0·10 to 0·12)	67·37 (66·76 to 67·92)	74·83 (74·26 to 75·4)	15·82 (15·46 to 16·14)	20·30 (19·94 to 20·67)	353 (339 to 369)	277 (266 to 290)
Armenia	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·16 (0·16 to 0·17)	0·07 (0·06 to 0·07)	72·38 (71·97 to 72·81)	78·65 (78·23 to 79·06)	17·93 (17·64 to 18·22)	21·51 (21·16 to 21·84)	14 (14 to 15)	14 (13 to 14)
Azerbaijan	0·04 (0·03 to 0·05)	0·03 (0·03 to 0·04)	0·19 (0·17 to 0·21)	0·09 (0·08 to 0·10)	67·23 (66·2 to 68·22)	74·66 (73·74 to 75·66)	15·1 (14·51 to 15·71)	20·27 (19·56 to 21)	45 (41 to 48)	31 (28 to 33)
Georgia	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·24 (0·23 to 0·25)	0·08 (0·08 to 0·09)	68·39 (67·96 to 68·81)	77·31 (76·89 to 77·73)	16·21 (15·99 to 16·45)	20·83 (20·53 to 21·13)	25 (25 to 26)	25 (24 to 26)
Kazakhstan	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·26 (0·24 to 0·27)	0·10 (0·10 to 0·11)	67·46 (66·76 to 68·16)	76·38 (75·75 to 77·06)	16·24 (15·84 to 16·65)	20·93 (20·50 to 21·42)	74 (71 to 78)	61 (57 to 64)
Kyrgyzstan	0·02 (0·02 to 0·02)	0·02 (0·02 to 0·02)	0·21 (0·20 to 0·21)	0·10 (0·09 to 0·10)	69·07 (68·7 to 69·44)	76·27 (75·88 to 76·65)	16·83 (16·6 to 17·06)	20·92 (20·64 to 21·21)	19 (18 to 19)	15 (15 to 16)
Mongolia	0·03 (0·02 to 0·04)	0·02 (0·02 to 0·03)	0·30 (0·27 to 0·33)	0·14 (0·12 to 0·15)	64·48 (63·18 to 65·94)	73·66 (72·47 to 74·84)	14·9 (14·16 to 15·68)	19·68 (18·85 to 20·52)	13 (12 to 14)	8 (8 to 9)
Tajikistan	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·18 (0·16 to 0·20)	0·12 (0·11 to 0·14)	67·67 (66·33 to 68·92)	73·3 (72·06 to 74·54)	17·19 (16·34 to 17·94)	20·75 (19·9 to 21·67)	28 (26 to 30)	20 (18 to 22)
Turkmenistan	0·03 (0·03 to 0·04)	0·03 (0·02 to 0·03)	0·25 (0·23 to 0·27)	0·13 (0·12 to 0·14)	66·54 (65·42 to 67·68)	73·87 (72·72 to 74·94)	16·27 (15·66 to 16·93)	20·05 (19·26 to 20·76)	19 (17 to 20)	14 (13 to 16)
Uzbekistan	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·21 (0·19 to 0·24)	0·12 (0·11 to 0·14)	67·12 (65·55 to 68·6)	73·75 (72·18 to 75·35)	15 (14·07 to 15·95)	19·38 (18·24 to 20·57)	116 (103 to 130)	89 (78 to 102)
Central Europe	0·01 (0·01 to 0·01)	0·01 (<0·01 to 0·01)	0·15 (0·15 to 0·16)	0·07 (0·06 to 0·07)	73·62 (73·34 to 73·92)	80·44 (80·19 to 80·70)	18·69 (18·49 to 18·88)	23·13 (22·94 to 23·34)	678 (663 to 695)	649 (633 to 665)
Albania	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·10 (0·08 to 0·13)	0·05 (0·04 to 0·06)	74·93 (72·83 to 77·11)	82·1 (79·9 to 84·32)	19·57 (18·12 to 21·14)	25 (23·18 to 26·9)	13 (11 to 16)	8 (7 to 11)
Bosnia and Herzegovina	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·13 (0·12 to 0·14)	0·06 (0·06 to 0·07)	74·34 (73·62 to 75·04)	79·06 (78·39 to 79·74)	18·62 (18·1 to 19·12)	21·57 (21·03 to 22·11)	19 (18 to 20)	18 (17 to 19)
Bulgaria	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·19 (0·18 to 0·20)	0·09 (0·08 to 0·09)	71·33 (70·60 to 72·11)	78·58 (77·88 to 79·24)	17·3 (16·83 to 17·82)	22·01 (21·49 to 22·52)	56 (53 to 60)	51 (48 to 55)
Croatia	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·12 (0·11 to 0·13)	0·05 (0·04 to 0·05)	75·39 (74·71 to 76·08)	81·61 (80·95 to 82·28)	19·28 (18·81 to 19·8)	23·57 (23·03 to 24·15)	25 (24 to 27)	26 (24 to 28)
Czech Republic	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·11 (0·10 to 0·12)	0·05 (0·05 to 0·06)	76·31 (75·6 to 77)	81·96 (81·29 to 82·6)	19·95 (19·42 to 20·46)	24·06 (23·52 to 24·57)	56 (52 to 59)	55 (51 to 59)
Hungary	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·17 (0·15 to 0·18)	0·08 (0·07 to 0·08)	73·19 (72·42 to 73·89)	80·20 (79·5 to 80·86)	18·13 (17·59 to 18·63)	23·02 (22·47 to 23·55)	60 (57 to 64)	62 (58 to 66)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Macedonia	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·13 (0·12 to 0·14)	0·07 (0·06 to 0·08)	73·88 (73·19 to 74·58)	79·68 (79·15 to 80·26)	18·34 (17·86 to 18·84)	22·91 (22·56 to 23·34)	12 (11 to 12)	8 (7 to 8)
Montenegro	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·13 (0·12 to 0·15)	0·07 (0·06 to 0·08)	74·06 (72·92 to 75·15)	78·93 (78·13 to 79·72)	18·2 (17·38 to 19)	21·55 (20·93 to 22·18)	3 (3 to 4)	3 (3 to 3)
Poland	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·16 (0·15 to 0·17)	0·06 (0·06 to 0·07)	74·07 (73·35 to 74·8)	81·85 (81·2 to 82·44)	19·3 (18·81 to 19·8)	24·32 (23·81 to 24·8)	204 (192 to 216)	191 (180 to 203)
Romania	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·19 (0·18 to 0·21)	0·08 (0·07 to 0·08)	71·55 (70·82 to 72·26)	78·95 (78·35 to 79·61)	17·8 (17·33 to 18·27)	22·27 (21·8 to 22·77)	136 (129 to 144)	125 (117 to 132)
Serbia	0·01 (0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·14 (0·13 to 0·15)	0·08 (0·07 to 0·08)	73·59 (72·93 to 74·24)	77·86 (77·2 to 78·54)	18·02 (17·58 to 18·48)	20·55 (20·04 to 21·09)	57 (54 to 60)	67 (62 to 71)
Slovakia	0·01 (0·01 to 0·01)	0·01 (<0·01 to 0·01)	0·14 (0·13 to 0·15)	0·06 (0·06 to 0·07)	74·09 (73·4 to 74·77)	80·57 (79·86 to 81·27)	18·73 (18·25 to 19·22)	23·18 (22·63 to 23·74)	27 (25 to 28)	26 (24 to 28)
Slovenia	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·10 (0·09 to 0·11)	0·04 (0·04 to 0·05)	77·92 (77·17 to 78·71)	84·22 (83·45 to 84·99)	21·31 (20·75 to 21·89)	26·01 (25·36 to 26·64)	10 (9 to 11)	10 (9 to 11)
Eastern Europe	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·30 (0·29 to 0·30)	0·11 (0·11 to 0·11)	66·49 (66·28 to 66·71)	77·24 (77·06 to 77·43)	16·14 (16·02 to 16·27)	21·66 (21·52 to 21·79)	1395 (1375 to 1415)	1376 (1355 to 1398)
Belarus	0·01 (0·01 to 0·01)	0·01 (<0·01 to 0·01)	0·23 (0·22 to 0·25)	0·08 (0·08 to 0·09)	68·96 (68·2 to 69·68)	78·78 (78·14 to 79·45)	16·01 (15·56 to 16·45)	22·06 (21·58 to 22·57)	60 (56 to 63)	61 (58 to 65)
Estonia	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·17 (0·14 to 0·19)	0·06 (0·05 to 0·07)	73·64 (71·97 to 75·29)	82·08 (80·69 to 83·49)	19·19 (18·11 to 20·29)	24·6 (23·52 to 25·72)	7 (6 to 8)	8 (7 to 9)
Latvia	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·23 (0·20 to 0·25)	0·08 (0·07 to 0·10)	70·13 (68·55 to 71·75)	79·85 (78·38 to 81·3)	17·22 (16·26 to 18·22)	23·07 (21·99 to 24·17)	13 (12 to 15)	15 (13 to 17)
Lithuania	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·24 (0·22 to 0·26)	0·08 (0·07 to 0·09)	69·63 (68·72 to 70·51)	80·20 (79·43 to 80·97)	17·16 (16·63 to 17·7)	23·39 (22·84 to 23·97)	20 (19 to 21)	21 (19 to 22)
Moldova	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·25 (0·24 to 0·26)	0·10 (0·09 to 0·10)	68·2 (67·78 to 68·66)	77·42 (77·01 to 77·86)	16·34 (16·1 to 16·6)	21·64 (21·33 to 21·96)	22 (21 to 23)	20 (19 to 20)
Russia	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·29 (0·29 to 0·30)	0·11 (0·11 to 0·11)	66·75 (66·63 to 66·89)	77·24 (77·12 to 77·36)	16·43 (16·36 to 16·5)	21·7 (21·62 to 21·78)	919 (911 to 926)	916 (907 to 925)
Ukraine	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·33 (0·31 to 0·35)	0·11 (0·10 to 0·12)	64·65 (63·86 to 65·44)	76·52 (75·78 to 77·19)	15·24 (14·84 to 15·64)	21·2 (20·69 to 21·66)	355 (337 to 373)	335 (317 to 357)
High income	**0·01 (0·01 to 0·01)**	**<0·01 (<0·01 to 0·01)**	**0·10 (0·10 to 0·10)**	**0·06 (0·06 to 0·06)**	**78·43 (78·25 to 78·61)**	**83·56 (83·38 to 83·74)**	**22·51 (22·38 to 22·63)**	**26·18 (26·04 to 26·32)**	**4885 (4812 to 4959)**	**4784 (4705 to 4866)**
Australasia	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·07 to 0·09)	0·05 (0·04 to 0·05)	80·13 (79·05 to 81·23)	84·42 (83·44 to 85·37)	23·52 (22·73 to 24·34)	26·58 (25·79 to 27·37)	106 (96 to 117)	98 (88 to 108)
Australia	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·07 to 0·09)	0·05 (0·04 to 0·05)	80·21 (78·94 to 81·49)	84·58 (83·42 to 85·74)	23·56 (22·66 to 24·48)	26·69 (25·74 to 27·64)	89 (79 to 100)	82 (72 to 92)
New Zealand	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·09 (0·08 to 0·09)	0·05 (0·05 to 0·06)	79·65 (79·03 to 80·29)	83·57 (82·98 to 84·16)	23·33 (22·88 to 23·81)	26·03 (25·53 to 26·5)	17 (16 to 18)	16 (15 to 17)
High-income Asia Pacific	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·07 to 0·08)	0·04 (0·03 to 0·04)	80·76 (80·49 to 81·03)	86·93 (86·71 to 87·15)	23·62 (23·42 to 23·82)	28·67 (28·49 to 28·84)	879 (858 to 901)	814 (796 to 832)
Brunei	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·15 (0·13 to 0·16)	0·10 (0·09 to 0·11)	73·35 (72·31 to 74·39)	77·5 (76·63 to 78·43)	18·9 (17·88 to 19·83)	21·58 (21 to 22·21)	1 (1 to 1)	1 (1 to 1)
Japan	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·07 to 0·07)	0·04 (0·03 to 0·04)	81·08 (80·80 to 81·34)	87·21 (86·96 to 87·44)	23·8 (23·59 to 24)	28·93 (28·73 to 29·11)	704 (688 to 722)	668 (652 to 685)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Singapore	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·06 (0·06 to 0·07)	0·03 (0·03 to 0·04)	81·93 (81·24 to 82·61)	87·55 (86·9 to 88·08)	24·28 (23·72 to 24·83)	29·13 (28·58 to 29·55)	11 (11 to 12)	9 (8 to 9)
South Korea	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·07 to 0·09)	0·04 (0·03 to 0·04)	79·52 (78·74 to 80·29)	85·48 (84·89 to 86·11)	22·64 (22·06 to 23·21)	27·23 (26·75 to 27·74)	163 (151 to 176)	136 (127 to 146)
High-income North America	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·13 (0·13 to 0·14)	0·08 (0·08 to 0·08)	76·46 (76·15 to 76·76)	81·38 (81·11 to 81·66)	21·9 (21·7 to 22·1)	24·87 (24·68 to 25·08)	1603 (1566 to 1642)	1534 (1498 to 1569)
Canada	0·01 (0·01 to 0·01)	0·01 (<0·01 to 0·01)	0·09 (0·08 to 0·09)	0·05 (0·05 to 0·06)	79·86 (79·2 to 80·53)	83·99 (83·36 to 84·57)	23·5 (23·02 to 24)	26·47 (25·96 to 26·92)	141 (133 to 150)	138 (131 to 147)
Greenland	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·18 (0·17 to 0·19)	0·11 (0·10 to 0·12)	70·84 (70·33 to 71·38)	77·15 (76·2 to 78·04)	17·5 (17·3 to 18·32)	22·05 (21·34 to 22·7)	<1 (<1 to <1)	<1 (<1 to <1)
USA	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·14 (0·14 to 0·14)	0·08 (0·08 to 0·08)	76·09 (75·76 to 76·42)	81·09 (80·80 to 81·38)	21·72 (21·51 to 21·94)	24·69 (24·48 to 24·91)	1461 (1424 to 1499)	1396 (1361 to 1431)
Southern Latin America	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·13 (0·12 to 0·15)	0·07 (0·07 to 0·08)	74·51 (73·32 to 75·55)	80·36 (79·33 to 81·28)	19·86 (19·06 to 20·58)	23·77 (22·98 to 24·48)	248 (228 to 272)	230 (211 to 253)
Argentina	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·14 (0·12 to 0·16)	0·08 (0·07 to 0·09)	73·57 (71·97 to 74·97)	79·67 (78·33 to 80·99)	19·2 (18·14 to 20·16)	23·35 (22·37 to 24·34)	172 (154 to 195)	160 (142 to 180)
Chile	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·11 (0·10 to 0·13)	0·06 (0·05 to 0·07)	77·19 (75·73 to 78·67)	82·11 (80·81 to 83·42)	21·76 (20·72 to 22·84)	24·85 (23·81 to 25·92)	59 (52 to 66)	54 (47 to 61)
Uruguay	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·15 (0·13 to 0·17)	0·08 (0·07 to 0·09)	73·51 (72·07 to 75·02)	80·43 (79·03 to 81·87)	19·26 (18·3 to 20·27)	23·94 (22·92 to 25·03)	17 (15 to 19)	17 (15 to 19)
Western Europe	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·08 to 0·08)	0·05 (0·04 to 0·05)	79·53 (79·19 to 79·84)	84·21 (83·9 to 84·51)	22·65 (22·4 to 22·89)	26·21 (25·96 to 26·46)	2049 (1992 to 2111)	2108 (2046 to 2174)
Andorra	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·06 to 0·09)	0·04 (0·04 to 0·05)	80·55 (79·43 to 81·68)	85·06 (83·58 to 86·74)	23·48 (22·79 to 24·22)	26·85 (25·59 to 28·34)	<1 (<1 to <1)	<1 (<1 to <1)
Austria	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·07 to 0·09)	0·04 (0·04 to 0·05)	79·4 (78·75 to 80·07)	84·03 (83·4 to 84·62)	22·41 (21·91 to 22·92)	25·94 (25·42 to 26·43)	39 (37 to 42)	42 (40 to 45)
Belgium	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·09 (0·08 to 0·09)	0·05 (0·05 to 0·05)	78·87 (78·22 to 79·55)	83·82 (83·14 to 84·45)	22·16 (21·66 to 22·66)	25·97 (25·43 to 26·48)	54 (51 to 57)	55 (52 to 59)
Cyprus	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·07 to 0·09)	0·04 (0·03 to 0·04)	78·45 (77·41 to 79·47)	85·21 (84·33 to 85·98)	21·46 (20·70 to 22·23)	26·96 (26·23 to 27·56)	5 (4 to 5)	3 (3 to 4)
Denmark	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·08 to 0·09)	0·05 (0·05 to 0·06)	78·81 (78·12 to 79·48)	82·69 (81·91 to 83·37)	21·86 (21·34 to 22·36)	24·83 (24·2 to 25·4)	27 (26 to 29)	27 (25 to 29)
Finland	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·10 (0·09 to 0·10)	0·04 (0·04 to 0·05)	78·55 (77·77 to 79·23)	84·28 (83·58 to 84·94)	22·1 (21·54 to 22·59)	26·15 (25·58 to 26·7)	28 (26 to 30)	27 (26 to 29)
France	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·09 (0·09 to 0·10)	0·05 (0·04 to 0·05)	79·82 (79·18 to 80·43)	85·72 (85·15 to 86·29)	23·38 (22·91 to 23·83)	27·84 (27·38 to 28·29)	289 (274 to 306)	290 (274 to 307)
Germany	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·09 (0·08 to 0·11)	0·05 (0·04 to 0·06)	78·24 (76·91 to 79·49)	83·01 (81·82 to 84·2)	21·61 (20·63 to 22·55)	25·11 (24·14 to 26·09)	464 (415 to 520)	484 (429 to 544)
Greece	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·10 (0·09 to 0·10)	0·05 (0·04 to 0·05)	78·44 (77·79 to 79·15)	83·56 (82·96 to 84·21)	22·12 (21·64 to 22·64)	25·67 (25·16 to 26·18)	63 (59 to 66)	57 (54 to 61)
Iceland	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·07 to 0·07)	0·04 (0·03 to 0·04)	79·83 (79·4 to 80·25)	85·94 (85·45 to 86·42)	22·63 (22·31 to 22·95)	27·57 (27·16 to 27·98)	1 (1 to 1)	1 (1 to 1)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Ireland	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·06 to 0·08)	0·05 (0·04 to 0·05)	80 (79·31 to 80·71)	83·68 (82·92 to 84·35)	22·83 (22·32 to 23·38)	25·6 (24·97 to 26·16)	16 (15 to 17)	15 (14 to 16)
Israel	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·06 to 0·07)	0·04 (0·03 to 0·04)	81·27 (80·60 to 81·92)	84·58 (83·93 to 85·25)	24·02 (23·5 to 24·52)	26·33 (25·77 to 26·9)	23 (21 to 24)	23 (22 to 25)
Italy	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·06 (0·06 to 0·07)	0·04 (0·03 to 0·04)	80·85 (80·22 to 81·43)	85·31 (84·72 to 85·91)	23·39 (22·91 to 23·84)	26·99 (26·5 to 27·5)	299 (282 to 317)	324 (303 to 344)
Luxembourg	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·06 to 0·08)	0·05 (0·04 to 0·05)	80·03 (78·91 to 81·2)	83·25 (82·31 to 84·22)	22·83 (21·99 to 23·73)	25·22 (24·44 to 26·02)	2 (2 to 2)	2 (2 to 3)
Malta	0·01 (0·01 to 0·01)	0·01 (<0·01 to 0·01)	0·07 (0·07 to 0·08)	0·04 (0·04 to 0·04)	78·91 (78·42 to 79·45)	83·02 (82·42 to 83·6)	21·99 (21·64 to 22·4)	25 (24·49 to 25·5)	2 (2 to 2)	2 (2 to 2)
Netherlands	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·06 to 0·07)	0·05 (0·05 to 0·06)	79·89 (79·25 to 80·50)	83·06 (82·42 to 83·71)	22·44 (21·95 to 22·92)	25·21 (24·68 to 25·74)	74 (69 to 79)	78 (73 to 84)
Norway	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·06 to 0·07)	0·04 (0·04 to 0·04)	80·46 (80·25 to 80·69)	84·17 (83·95 to 84·39)	23·11 (22·95 to 23·28)	25·94 (25·77 to 26·12)	20 (20 to 21)	21 (21 to 22)
Portugal	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·10 (0·09 to 0·11)	0·04 (0·04 to 0·05)	78·51 (77·86 to 79·23)	84·22 (83·6 to 84·82)	22·15 (21·68 to 22·68)	26·11 (25·62 to 26·61)	57 (53 to 60)	57 (53 to 61)
Spain	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·07 (0·07 to 0·08)	0·04 (0·03 to 0·04)	80·21 (79·65 to 80·80)	85·82 (85·31 to 86·34)	23·03 (22·6 to 23·48)	27·53 (27·11 to 27·97)	211 (200 to 222)	206 (195 to 218)
Sweden	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·06 (0·06 to 0·07)	0·04 (0·04 to 0·04)	80·79 (80·22 to 81·35)	84·18 (83·65 to 84·71)	23·36 (22·92 to 23·8)	25·91 (25·47 to 26·36)	45 (42 to 47)	47 (45 to 50)
Switzerland	<0·01 (<0·01 to <0·01)	<0·01 (<0·01 to <0·01)	0·05 (0·05 to 0·06)	0·03 (0·03 to 0·04)	82·12 (81·53 to 82·78)	85·66 (85·09 to 86·27)	24·46 (23·99 to 24·98)	27·32 (26·84 to 27·84)	31 (29 to 33)	34 (31 to 36)
UK	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·08 to 0·08)	0·05 (0·05 to 0·06)	79·18 (79·05 to 79·32)	82·72 (82·59 to 82·85)	22·5 (22·42 to 22·6)	25·05 (24·95 to 25·14)	299 (295 to 302)	310 (306 to 313)
England	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·08 (0·08 to 0·08)	0·05 (0·05 to 0·05)	79·49 (79·39 to 79·59)	82·91 (82·83 to 83·01)	22·67 (22·61 to 22·75)	25·18 (25·11 to 25·26)	245 (243 to 247)	256 (254 to 258)
Northern Ireland	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to 0·01)	0·09 (0·08 to 0·1)	0·06 (0·05 to 0·06)	78·74 (77·74 to 79·77)	82·48 (81·45 to 83·44)	22·39 (21·68 to 23·15)	24·92 (24·11 to 25·69)	8 (7 to 8)	8 (7 to 9)
Scotland	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·12 (0·1 to 0·13)	0·07 (0·06 to 0·08)	76·91 (75·95 to 77·96)	81·2 (80·33 to 82·12)	21·29 (20·63 to 22·02)	23·99 (23·34 to 24·73)	29 (26 to 31)	29 (27 to 32)
Wales	<0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·1 (0·09 to 0·1)	0·06 (0·05 to 0·06)	78·27 (77·52 to 79·1)	82·47 (81·67 to 83·23)	22 (21·45 to 22·59)	24·88 (24·24 to 25·49)	17 (16 to 18)	16 (15 to 18)
Latin America and Caribbean	**0·02 (0·02 to 0·02)**	**0·02 (0·01 to 0·02)**	**0·17 (0·17 to 0·18)**	**0·09 (0·09 to 0·09)**	**72·79 (72·44 to 73·16)**	**78·94 (78·63 to 79·23)**	**20·94 (20·80 to 21·09)**	**23·72 (23·57 to 23·87)**	**1895 (1863 to 1928)**	**1501 (1475 to 1527)**
Andean Latin America	0·02 (0·02 to 0·03)	0·02 (0·01 to 0·02)	0·12 (0·11 to 0·13)	0·08 (0·07 to 0·09)	76·18 (74·95 to 77·35)	79·49 (78·39 to 80·58)	22·62 (21·77 to 23·44)	24·19 (23·37 to 25)	159 (146 to 174)	137 (124 to 150)
Bolivia	0·03 (0·03 to 0·04)	0·03 (0·02 to 0·03)	0·14 (0·11 to 0·18)	0·12 (0·09 to 0·15)	71·3 (68·76 to 73·93)	74·15 (72·08 to 76·58)	18·45 (16·43 to 20·49)	20·36 (19·01 to 22·22)	35 (28 to 43)	32 (26 to 37)
Ecuador	0·02 (0·02 to 0·02)	0·02 (0·01 to 0·02)	0·15 (0·13 to 0·17)	0·09 (0·08 to 0·10)	74·77 (73·32 to 76·08)	78·72 (77·48 to 79·92)	22·26 (21·44 to 23·06)	23·5 (22·63 to 24·36)	48 (43 to 53)	40 (36 to 44)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Peru	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·10 (0·08 to 0·12)	0·07 (0·06 to 0·08)	78·74 (76·78 to 80·79)	81·89 (80·05 to 83·73)	24·28 (22·95 to 25·69)	25·91 (24·48 to 27·31)	77 (65 to 89)	65 (55 to 77)
Caribbean	0·04 (0·03 to 0·05)	0·03 (0·03 to 0·04)	0·18 (0·17 to 0·20)	0·12 (0·11 to 0·14)	70·35 (69·35 to 71·43)	75·39 (74·36 to 76·39)	19·78 (19·25 to 20·34)	22·63 (22·02 to 23·23)	196 (185 to 208)	164 (154 to 175)
Antigua and Barbuda	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·13 (0·12 to 0·14)	0·09 (0·08 to 0·09)	75·28 (74·4 to 76·15)	78·74 (78·13 to 79·36)	20·97 (20·38 to 21·55)	22·48 (21·97 to 23·07)	<1 (<1 to <1)	<1 (<1 to <1)
The Bahamas	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·22 (0·20 to 0·24)	0·13 (0·12 to 0·14)	70·84 (69·58 to 72·12)	76·58 (75·41 to 77·89)	19·81 (19·09 to 20·56)	22·35 (21·54 to 23·25)	1 (1 to 1)	1 (1 to 1)
Barbados	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·13 (0·12 to 0·15)	0·09 (0·08 to 0·10)	75·49 (74·44 to 76·64)	78·63 (77·73 to 79·62)	21·28 (20·59 to 22·02)	23·23 (22·63 to 23·97)	1 (1 to 1)	1 (1 to 2)
Belize	0·02 (0·02 to 0·02)	0·02 (0·01 to 0·02)	0·21 (0·21 to 0·22)	0·12 (0·11 to 0·12)	71·25 (70·67 to 71·84)	77·4 (76·87 to 77·94)	20·73 (20·42 to 21·07)	23·02 (22·68 to 23·38)	1 (1 to 1)	1 (1 to 1)
Bermuda	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to 0·01)	0·11 (0·10 to 0·12)	0·04 (0·03 to 0·04)	77·05 (76·42 to 77·6)	85·67 (84·82 to 86·53)	21·11 (20·59 to 21·45)	27·61 (26·92 to 28·31)	<1 (<1 to <1)	<1 (<1 to <1)
Cuba	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to 0·01)	0·12 (0·11 to 0·14)	0·07 (0·06 to 0·08)	76·18 (74·64 to 77·65)	80·71 (79·32 to 82·1)	20·76 (19·7 to 21·79)	23·68 (22·6 to 24·79)	55 (49 to 62)	46 (41 to 53)
Dominica	0·03 (0·03 to 0·04)	0·03 (0·02 to 0·03)	0·17 (0·16 to 0·19)	0·10 (0·09 to 0·11)	70·42 (69·42 to 71·4)	75·36 (74·33 to 76·4)	19·01 (18·46 to 19·53)	21·55 (20·89 to 22·3)	<1 (<1 to <1)	<1 (<1 to <1)
Dominican Republic	0·03 (0·03 to 0·04)	0·03 (0·02 to 0·03)	0·21 (0·18 to 0·24)	0·11 (0·10 to 0·13)	69·78 (67·83 to 71·9)	76·77 (75·17 to 78·47)	19·48 (18·33 to 20·86)	23·12 (22·08 to 24·32)	40 (35 to 45)	27 (24 to 31)
Grenada	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·18 (0·17 to 0·19)	0·12 (0·11 to 0·13)	72·99 (72·31 to 73·65)	75·41 (74·68 to 76·15)	20·11 (19·67 to 20·53)	20·53 (19·98 to 21·14)	1 (1 to 1)	1 (1 to 1)
Guyana	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·27 (0·24 to 0·31)	0·17 (0·15 to 0·20)	66·36 (64·55 to 68·16)	72·16 (70·49 to 73·9)	17·01 (16 to 18·04)	19·56 (18·49 to 20·70)	3 (3 to 3)	2 (2 to 3)
Haiti	0·06 (0·05 to 0·08)	0·05 (0·05 to 0·06)	0·25 (0·20 to 0·30)	0·22 (0·18 to 0·27)	63·83 (61·44 to 66·42)	65·96 (63·27 to 68·75)	16·05 (15 to 17·52)	16·95 (15·36 to 18·92)	45 (39 to 52)	43 (36 to 52)
Jamaica	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·18 (0·15 to 0·21)	0·11 (0·09 to 0·13)	71·96 (69·85 to 74·14)	77·48 (75·41 to 79·4)	19·14 (17·88 to 20·50)	22·3 (20·77 to 23·72)	11 (9 to 13)	9 (8 to 11)
Puerto Rico	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·17 (0·16 to 0·18)	0·08 (0·07 to 0·08)	74·52 (73·69 to 75·39)	81·6 (80·88 to 82·32)	22·38 (21·84 to 22·94)	25·76 (25·2 to 26·32)	18 (17 to 20)	16 (15 to 17)
Saint Lucia	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·18 (0·16 to 0·19)	0·10 (0·09 to 0·11)	73·12 (72·24 to 74)	78·08 (77·2 to 78·93)	20·57 (20·04 to 21·13)	22·62 (21·98 to 23·2)	1 (1 to 1)	1 (1 to 1)
Saint Vincent and the Grenadines	0·02 (0·02 to 0·02)	0·01 (0·01 to 0·02)	0·21 (0·20 to 0·22)	0·13 (0·12 to 0·14)	69·65 (68·86 to 70·38)	75·41 (74·56 to 76·29)	18·08 (17·66 to 18·49)	21·18 (20·59 to 21·74)	1 (1 to 1)	<1 (<1 to <1)
Suriname	0·03 (0·03 to 0·04)	0·03 (0·02 to 0·03)	0·22 (0·19 to 0·24)	0·12 (0·11 to 0·14)	68·95 (67·25 to 70·72)	75·28 (73·98 to 76·61)	18·37 (17·36 to 19·42)	21·97 (21·05 to 22·9)	2 (2 to 3)	2 (2 to 2)
Trinidad and Tobago	0·02 (0·02 to 0·02)	0·01 (0·01 to 0·02)	0·19 (0·15 to 0·24)	0·11 (0·08 to 0·14)	71·13 (68·45 to 73·95)	77·55 (74·82 to 80·33)	19·1 (17·43 to 20·85)	22·73 (20·81 to 24·81)	6 (5 to 8)	5 (4 to 6)
Virgin Islands	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·22 (0·19 to 0·25)	0·09 (0·08 to 0·11)	69·49 (67·94 to 71·76)	78·78 (77·23 to 80·05)	16·61 (15·8 to 18·7)	22·72 (21·66 to 23·66)	1 (1 to 1)	1 (<1 to 1)
Central Latin America	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·17 (0·17 to 0·18)	0·09 (0·08 to 0·09)	73·3 (72·79 to 73·82)	79·42 (79·01 to 79·82)	21·44 (21·17 to 21·72)	23·87 (23·6 to 24·14)	766 (742 to 792)	593 (575 to 611)
Colombia	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·12 (0·11 to 0·14)	0·06 (0·05 to 0·07)	77·44 (75·94 to 79·03)	82·68 (81·36 to 83·95)	24·03 (23·03 to 25·03)	26·31 (25·27 to 27·32)	127 (113 to 143)	107 (95 to 121)
Costa Rica	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·13 (0·12 to 0·14)	0·06 (0·06 to 0·07)	76·31 (75·53 to 77·13)	82·67 (81·86 to 83·4)	21·83 (21·33 to 22·36)	25·68 (25·04 to 26·25)	14 (13 to 14)	10 (9 to 11)
El Salvador	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·26 (0·21 to 0·30)	0·10 (0·08 to 0·13)	69·29 (66·66 to 72·05)	78·3 (75·98 to 80·41)	19·96 (18·64 to 21·41)	22·92 (21·25 to 24·51)	23 (20 to 27)	18 (15 to 22)
Guatemala	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·03)	0·23 (0·20 to 0·25)	0·12 (0·10 to 0·14)	69·14 (67·44 to 70·76)	75·99 (74·53 to 77·38)	19·72 (18·87 to 20·60)	22·14 (21·17 to 23·16)	52 (46 to 58)	38 (33 to 42)
Honduras	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·17 (0·13 to 0·21)	0·14 (0·10 to 0·17)	72·88 (70·17 to 75·6)	74·96 (72·41 to 78·18)	20·52 (19·01 to 22·22)	20·80 (19·3 to 23·23)	23 (19 to 27)	22 (17 to 26)
Mexico	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·19 (0·18 to 0·19)	0·09 (0·09 to 0·09)	72·56 (72·27 to 72·85)	78·5 (78·22 to 78·76)	20·77 (20·64 to 20·89)	22·98 (22·84 to 23·13)	401 (396 to 407)	310 (305 to 315)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Nicaragua	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·14 (0·12 to 0·16)	0·07 (0·06 to 0·09)	76·92 (75·26 to 78·41)	80·64 (79·36 to 82·04)	23·58 (22·5 to 24·57)	24·64 (23·71 to 25·7)	12 (11 to 14)	11 (10 to 12)
Panama	0·02 (0·02 to 0·02)	0·02 (0·01 to 0·02)	0·12 (0·11 to 0·13)	0·07 (0·06 to 0·07)	77·01 (76·17 to 77·93)	81·7 (80·93 to 82·47)	23·58 (23·07 to 24·15)	25·89 (25·35 to 26·46)	11 (10 to 11)	8 (8 to 9)
Venezuela	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·20 (0·17 to 0·23)	0·08 (0·07 to 0·10)	71·23 (68·89 to 73·7)	79·6 (77·73 to 81·49)	20·41 (19·11 to 21·8)	24·03 (22·63 to 25·52)	104 (87 to 121)	69 (58 to 81)
Tropical Latin America	0·02 (0·02 to 0·02)	0·02 (0·01 to 0·02)	0·19 (0·18 to 0·19)	0·09 (0·09 to 0·09)	72·03 (71·75 to 72·29)	79·07 (78·81 to 79·28)	20·35 (20·28 to 20·43)	23·72 (23·65 to 23·8)	774 (767 to 781)	608 (602 to 614)
Brazil	0·02 (0·02 to 0·02)	0·02 (0·01 to 0·02)	0·19 (0·18 to 0·19)	0·09 (0·09 to 0·09)	71·98 (71·71 to 72·23)	79·06 (78·81 to 79·27)	20·36 (20·30 to 20·43)	23·74 (23·66 to 23·81)	755 (749 to 761)	594 (588 to 599)
Paraguay	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·16 (0·12 to 0·19)	0·09 (0·07 to 0·11)	73·44 (70·99 to 75·98)	78·93 (76·76 to 81·19)	20·04 (18·49 to 21·72)	23·24 (21·66 to 24·95)	19 (15 to 22)	14 (11 to 17)
North Africa and Middle East	**0·03 (0·03 to 0·03)**	**0·02 (0·02 to 0·03)**	**0·15 (0·14 to 0·15)**	**0·10 (0·09 to 0·10)**	**72 (71·53 to 72·49)**	**76·85 (76·4 to 77·32)**	**19·32 (19·02 to 19·64)**	**22·53 (22·21 to 22·86)**	**1684 (1628 to 1742)**	**1179 (1135 to 1224)**
Afghanistan	0·06 (0·05 to 0·06)	0·05 (0·04 to 0·06)	0·27 (0·21 to 0·32)	0·28 (0·23 to 0·34)	63·56 (61·28 to 65·89)	63·18 (60·63 to 65·85)	15·43 (14·64 to 16·33)	15·07 (14·18 to 16·33)	115 (100 to 131)	112 (96 to 130)
Algeria	0·02 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·09 (0·09 to 0·10)	0·07 (0·07 to 0·08)	77·03 (76·39 to 77·61)	78·48 (77·89 to 79·06)	22·46 (22 to 22·88)	23·05 (22·61 to 23·5)	90 (85 to 95)	78 (74 to 83)
Bahrain	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·06 (0·06 to 0·07)	0·05 (0·05 to 0·06)	78·8 (77·81 to 79·84)	80·44 (79·49 to 81·38)	21·67 (20·87 to 22·51)	22·82 (22·02 to 23·63)	2 (2 to 2)	1 (1 to 1)
Egypt	0·02 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·20 (0·18 to 0·23)	0·13 (0·11 to 0·14)	67·96 (66·61 to 69·31)	74·33 (72·88 to 75·79)	15·16 (14·39 to 15·97)	19·98 (18·99 to 20·97)	316 (284 to 353)	183 (161 to 206)
Iran	0·02 (0·02 to 0·02)	0·01 (0·01 to 0·01)	0·12 (0·12 to 0·12)	0·06 (0·06 to 0·06)	75·47 (75·38 to 75·55)	79·36 (79·28 to 79·46)	21·2 (21·15 to 21·25)	22·79 (22·73 to 22·85)	219 (217 to 220)	161 (160 to 162)
Iraq	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·03)	0·15 (0·14 to 0·16)	0·08 (0·07 to 0·08)	74·79 (73·85 to 75·6)	78·83 (78·06 to 79·65)	23·58 (22·92 to 24·2)	24·42 (23·81 to 25·01)	92 (87 to 97)	60 (56 to 65)
Jordan	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·08 (0·07 to 0·10)	0·05 (0·04 to 0·06)	77·85 (76·34 to 79·18)	81·07 (79·84 to 82·31)	22·16 (20·89 to 23·22)	24·07 (23·12 to 25·09)	16 (15 to 18)	11 (10 to 13)
Kuwait	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·08 (0·07 to 0·08)	0·03 (0·03 to 0·03)	80·66 (79·98 to 81·35)	87·18 (86·69 to 87·67)	24·31 (23·81 to 24·83)	29·22 (28·81 to 29·62)	6 (5 to 6)	2 (2 to 2)
Lebanon	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·12 (0·11 to 0·13)	0·07 (0·06 to 0·08)	75·8 (75·05 to 76·38)	79·95 (79·37 to 80·71)	20·51 (19·82 to 20·99)	23·14 (22·7 to 23·74)	17 (16 to 19)	16 (15 to 17)
Libya	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·18 (0·15 to 0·21)	0·12 (0·10 to 0·14)	71·14 (69·36 to 73·18)	74·97 (73·27 to 76·87)	18·82 (17·7 to 20·13)	20·21 (18·97 to 21·62)	20 (17 to 23)	14 (12 to 17)
Morocco	0·02 (0·02 to 0·03)	0·02 (0·01 to 0·02)	0·13 (0·10 to 0·16)	0·12 (0·10 to 0·15)	73·23 (71 to 75·48)	74·7 (72·66 to 76·8)	19·48 (17·91 to 21·12)	20·19 (18·78 to 21·61)	113 (95 to 136)	107 (90 to 128)
Oman	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·11 (0·08 to 0·13)	0·07 (0·06 to 0·09)	75·47 (73·25 to 77·89)	79·44 (78·21 to 81·24)	20·10 (18·48 to 21·94)	22·87 (22·05 to 24·28)	7 (6 to 9)	4 (3 to 4)
Palestine	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·11 (0·10 to 0·11)	0·07 (0·06 to 0·07)	75·62 (74·72 to 76·43)	78 (77·32 to 78·85)	20·39 (19·58 to 21·09)	21·25 (20·70 to 21·96)	7 (7 to 8)	7 (7 to 8)
Qatar	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·07 (0·05 to 0·08)	0·05 (0·04 to 0·06)	79·55 (77·69 to 81·55)	81·66 (79·84 to 83·51)	22·73 (21·29 to 24·29)	23·98 (22·46 to 25·58)	3 (2 to 4)	1 (1 to 1)
Saudi Arabia	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·13 (0·10 to 0·15)	0·08 (0·07 to 0·10)	75·29 (73·87 to 76·57)	79·43 (78·04 to 80·23)	20·31 (19·39 to 20·94)	23·08 (22·24 to 23·7)	64 (55 to 74)	30 (27 to 35)
Sudan	0·05 (0·05 to 0·06)	0·04 (0·04 to 0·05)	0·16 (0·13 to 0·21)	0·14 (0·11 to 0·18)	68·85 (66·37 to 71·45)	72·02 (69·54 to 74·68)	18·26 (16·45 to 20·17)	20·15 (18·44 to 21·92)	120 (101 to 140)	89 (75 to 104)
Syria	0·02 (0·02 to 0·02)	0·02 (0·02 to 0·02)	0·28 (0·25 to 0·30)	0·13 (0·11 to 0·14)	65·49 (63·79 to 67·19)	75·04 (73·98 to 76·31)	18·57 (17·16 to 20·12)	22·37 (21·8 to 23·31)	76 (68 to 85)	39 (35 to 42)
Tunisia	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·10 (0·08 to 0·13)	0·06 (0·04 to 0·07)	76·09 (73·66 to 78·57)	80·72 (78·47 to 83·03)	20·57 (18·86 to 22·46)	23·62 (21·84 to 25·54)	38 (30 to 47)	28 (22 to 35)
Turkey	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·02)	0·11 (0·10 to 0·12)	0·05 (0·05 to 0·06)	75·2 (74·14 to 76·25)	83·04 (82·04 to 84·04)	20·02 (19·24 to 20·81)	26·17 (25·35 to 26·99)	246 (225 to 269)	156 (141 to 172)
United Arab Emirates	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·15 (0·12 to 0·19)	0·09 (0·07 to 0·12)	71·65 (69·35 to 74·05)	76·94 (74·73 to 79·19)	16·74 (15·15 to 18·43)	20·33 (18·63 to 22·11)	22 (17 to 27)	5 (4 to 6)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Yemen	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·22 (0·18 to 0·27)	0·16 (0·13 to 0·20)	65·98 (63·58 to 68·33)	70·27 (67·58 to 72·72)	16·81 (15·48 to 18·48)	19·2 (17·29 to 20·83)	93 (77 to 113)	72 (58 to 89)
South Asia	**0·04 (0·04 to 0·05)**	**0·05 (0·04 to 0·05)**	**0·20 (0·20 to 0·21)**	**0·15 (0·15 to 0·16)**	**67·91 (67·4 to 68·45)**	**70·21 (69·66 to 70·74)**	**17·41 (17·19 to 17·64)**	**18·77 (18·52 to 19·02)**	**6587 (6400 to 6768)**	**5813 (5652 to 5982)**
Bangladesh	0·03 (0·03 to 0·04)	0·03 (0·03 to 0·04)	0·15 (0·13 to 0·17)	0·11 (0·10 to 0·13)	71·8 (70·29 to 73·34)	74·6 (73·05 to 76·03)	19·49 (18·45 to 20·55)	21·24 (20·19 to 22·32)	503 (447 to 562)	384 (341 to 433)
Bhutan	0·03 (0·02 to 0·04)	0·03 (0·02 to 0·03)	0·13 (0·11 to 0·16)	0·10 (0·08 to 0·12)	72·34 (69·83 to 74·79)	76·04 (73·93 to 78·11)	19·08 (17·08 to 20·80)	21·84 (20·23 to 23·39)	2 (2 to 3)	2 (1 to 2)
India	0·04 (0·04 to 0·05)	0·04 (0·04 to 0·05)	0·21 (0·20 to 0·22)	0·15 (0·15 to 0·16)	67·81 (67·25 to 68·33)	70·18 (69·53 to 70·76)	17·2 (17 to 17·39)	18·6 (18·37 to 18·82)	5230 (5115 to 5360)	4680 (4564 to 4798)
Nepal	0·03 (0·03 to 0·04)	0·03 (0·03 to 0·04)	0·18 (0·15 to 0·22)	0·13 (0·11 to 0·16)	68·72 (67·24 to 70·56)	73·28 (71·54 to 75·11)	16·58 (16·02 to 18)	20·04 (18·89 to 21·23)	103 (89 to 113)	80 (70 to 92)
Pakistan	0·06 (0·05 to 0·07)	0·06 (0·05 to 0·07)	0·21 (0·17 to 0·25)	0·18 (0·14 to 0·21)	66·31 (63·8 to 69·1)	67·41 (65·07 to 70·12)	17·33 (15·77 to 18·97)	17·99 (16·41 to 19·74)	749 (633 to 880)	667 (566 to 775)
Southeast Asia, east Asia, and Oceania	**0·02 (0·02 to 0·02)**	**0·02 (0·01 to 0·02)**	**0·14 (0·13 to 0·14)**	**0·07 (0·07 to 0·07)**	**72·91 (72·54 to 73·33)**	**78·56 (78·21 to 78·9)**	**19·01 (18·75 to 19·28)**	**22·48 (22·22 to 22·75)**	**8837 (8562 to 9099)**	**6574 (6370 to 6782)**
East Asia	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·12 (0·11 to 0·12)	0·06 (0·05 to 0·06)	74·46 (73·98 to 74·94)	79·88 (79·43 to 80·30)	19·4 (19·08 to 19·74)	22·82 (22·49 to 23·15)	6375 (6121 to 6624)	4670 (4483 to 4866)
China	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·11 (0·11 to 0·12)	0·05 (0·05 to 0·06)	74·52 (74·05 to 75·01)	79·92 (79·44 to 80·36)	19·39 (19·07 to 19·74)	22·81 (22·47 to 23·16)	6052 (5802 to 6297)	4400 (4214 to 4591)
North Korea	0·02 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·20 (0·16 to 0·24)	0·11 (0·09 to 0·14)	68·64 (67·1 to 70·21)	75·05 (72·91 to 77·17)	16·45 (15·92 to 17·04)	20·54 (19·1 to 22·07)	113 (101 to 126)	122 (101 to 146)
Taiwan (province of China)	0·01 (<0·01 to 0·01)	<0·01 (<0·01 to <0·01)	0·13 (0·12 to 0·14)	0·05 (0·05 to 0·06)	76·82 (76·1 to 77·51)	83·26 (82·63 to 83·87)	21·77 (21·29 to 22·23)	25·67 (25·18 to 26·17)	106 (100 to 112)	73 (69 to 78)
Oceania	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·41 (0·35 to 0·47)	0·30 (0·25 to 0·36)	58·2 (55·92 to 60·60)	63·38 (61·1 to 65·54)	13·41 (12·71 to 14·17)	15·71 (15 to 16·41)	65 (56 to 74)	45 (39 to 52)
American Samoa	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·21 (0·19 to 0·23)	0·15 (0·14 to 0·17)	69·99 (68·51 to 71·65)	73·8 (72·94 to 74·78)	17·11 (15·92 to 18·64)	19·66 (19·24 to 20·19)	<1 (<1 to <1)	<1 (<1 to <1)
Federated States of Micronesia	0·02 (0·02 to 0·02)	0·02 (0·01 to 0·02)	0·30 (0·25 to 0·35)	0·22 (0·17 to 0·27)	64·98 (62·8 to 67·25)	69·58 (67·15 to 71·68)	15·12 (14·39 to 15·83)	17·66 (16·48 to 18·51)	<1 (<1 to <1)	<1 (<1 to <1)
Fiji	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·03)	0·26 (0·22 to 0·29)	0·18 (0·15 to 0·21)	65·9 (64·17 to 67·7)	70·40 (68·44 to 72·51)	14·94 (13·93 to 16·02)	17·56 (16·27 to 19·02)	4 (3 to 5)	3 (3 to 4)
Guam	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·23 (0·21 to 0·25)	0·12 (0·11 to 0·13)	70·23 (69·19 to 71·34)	76·4 (75·31 to 77·46)	18·82 (18·21 to 19·49)	21·5 (20·72 to 22·26)	1 (1 to 1)	1 (<1 to 1)
Kiribati	0·05 (0·04 to 0·05)	0·04 (0·03 to 0·05)	0·41 (0·35 to 0·47)	0·23 (0·19 to 0·28)	58·59 (56·21 to 61·05)	66·31 (63·94 to 68·86)	13·14 (12·39 to 14·07)	16·2 (15·27 to 17·67)	1 (<1 to 1)	<1 (<1 to 1)
Marshall Islands	0·02 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·33 (0·29 to 0·39)	0·27 (0·22 to 0·31)	62·57 (60·56 to 64·61)	66·82 (64·55 to 68·96)	13·46 (12·53 to 14·46)	16·44 (15·33 to 17·38)	<1 (<1 to <1)	<1 (<1 to <1)
Northern Mariana Islands	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·15 (0·13 to 0·18)	0·09 (0·07 to 0·10)	73·59 (72·32 to 75·01)	79·25 (78·02 to 80·15)	19·45 (18·3 to 20·42)	22·96 (22·21 to 23·71)	<1 (<1 to <1)	<1 (<1 to <1)
Papua New Guinea	0·06 (0·05 to 0·07)	0·05 (0·04 to 0·06)	0·45 (0·38 to 0·52)	0·34 (0·28 to 0·40)	56·23 (53·56 to 59·16)	61·23 (58·55 to 63·85)	12·6 (11·72 to 13·62)	14·49 (13·56 to 15·38)	50 (42 to 59)	34 (29 to 41)
Samoa	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·16 (0·13 to 0·19)	0·13 (0·11 to 0·16)	71·28 (70·03 to 72·69)	74·49 (72·89 to 76·7)	17·43 (17·07 to 18·21)	19·95 (18·96 to 21·52)	1 (1 to 1)	1 (<1 to 1)
Solomon Islands	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·03)	0·30 (0·25 to 0·35)	0·24 (0·20 to 0·29)	64·12 (62 to 66·31)	67·52 (65·39 to 69·43)	14·93 (14·1 to 15·81)	16·7 (15·85 to 17·37)	2 (2 to 3)	2 (2 to 2)
Tonga	0·02 (0·02 to 0·02)	0·01 (0·01 to 0·02)	0·22 (0·18 to 0·26)	0·12 (0·10 to 0·15)	68·62 (66·74 to 70·06)	75·14 (73·33 to 77·21)	16·57 (15·63 to 17·2)	20·35 (19·17 to 21·83)	<1 (<1 to <1)	<1 (<1 to <1)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Vanuatu	0·03 (0·03 to 0·04)	0·03 (0·02 to 0·03)	0·34 (0·28 to 0·42)	0·23 (0·18 to 0·29)	62·11 (59·17 to 64·96)	67·75 (65·02 to 70·22)	14·21 (13·05 to 15·32)	16·67 (15·66 to 17·82)	1 (1 to 2)	1 (1 to 1)
Southeast Asia	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·19 (0·18 to 0·20)	0·11 (0·11 to 0·12)	69·45 (68·87 to 70·02)	75·76 (75·18 to 76·29)	17·57 (17·23 to 17·91)	21·4 (20·99 to 21·78)	2397 (2302 to 2496)	1859 (1781 to 1947)
Cambodia	0·03 (0·03 to 0·04)	0·03 (0·02 to 0·03)	0·23 (0·19 to 0·27)	0·14 (0·12 to 0·17)	66·77 (65·28 to 68·26)	72·7 (70·59 to 74·24)	16·06 (15·66 to 16·45)	19·6 (18·19 to 20·56)	54 (49 to 60)	48 (43 to 56)
Indonesia	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·03)	0·18 (0·17 to 0·19)	0·13 (0·12 to 0·14)	69·21 (68·39 to 70·07)	73·87 (73·03 to 74·67)	16·69 (16·18 to 17·31)	19·89 (19·29 to 20·43)	904 (850 to 957)	738 (694 to 791)
Laos	0·06 (0·05 to 0·08)	0·05 (0·04 to 0·06)	0·22 (0·19 to 0·26)	0·15 (0·12 to 0·18)	65·05 (62·98 to 67·11)	70·32 (68·26 to 72·28)	16·31 (15·3 to 17·53)	19·32 (17·86 to 20·59)	26 (23 to 29)	20 (17 to 23)
Malaysia	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·16 (0·15 to 0·18)	0·09 (0·08 to 0·10)	72·4 (71·26 to 73·48)	77·34 (76·36 to 78·35)	18·2 (17·44 to 18·96)	20·80 (20·05 to 21·61)	96 (88 to 105)	69 (62 to 76)
Maldives	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·07 (0·06 to 0·07)	0·05 (0·04 to 0·05)	79·93 (79·22 to 80·62)	83·37 (82·62 to 84·15)	23·06 (22·52 to 23·6)	25·73 (25·07 to 26·4)	1 (1 to 1)	<1 (<1 to <1)
Mauritius	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·19 (0·17 to 0·20)	0·09 (0·08 to 0·10)	71·54 (70·65 to 72·46)	78·1 (77·23 to 78·96)	18·65 (18·11 to 19·22)	22·27 (21·63 to 22·91)	6 (5 to 6)	5 (4 to 5)
Myanmar	0·05 (0·04 to 0·06)	0·04 (0·03 to 0·04)	0·25 (0·21 to 0·29)	0·14 (0·11 to 0·17)	64·86 (63·15 to 66·71)	72·15 (70·26 to 74·22)	15·86 (15·44 to 16·65)	20·04 (18·76 to 21·46)	229 (204 to 251)	181 (155 to 209)
Philippines	0·03 (0·02 to 0·04)	0·02 (0·02 to 0·03)	0·24 (0·20 to 0·28)	0·13 (0·11 to 0·16)	66·58 (64·65 to 68·61)	73·1 (71·16 to 74·95)	15·87 (14·71 to 17·14)	19·55 (18·26 to 20·78)	380 (327 to 437)	287 (247 to 334)
Sri Lanka	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·15 (0·12 to 0·18)	0·06 (0·05 to 0·08)	73·83 (71·67 to 75·96)	81·05 (79·55 to 83·32)	19·49 (18·2 to 20·83)	23·97 (22·83 to 25·89)	73 (61 to 87)	53 (41 to 61)
Seychelles	0·01 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·21 (0·20 to 0·22)	0·10 (0·09 to 0·11)	70·11 (69·49 to 70·74)	77·69 (76·95 to 78·44)	17·57 (17·21 to 17·94)	22·12 (21·61 to 22·66)	<1 (<1 to <1)	<1 (<1 to <1)
Thailand	0·01 (0·01 to 0·01)	0·01 (0·01 to 0·01)	0·18 (0·16 to 0·20)	0·08 (0·07 to 0·08)	74·32 (72·91 to 75·92)	81·96 (80·85 to 83·14)	22·15 (21·29 to 23·15)	25·83 (24·97 to 26·75)	273 (244 to 301)	195 (174 to 215)
Timor-Leste	0·04 (0·03 to 0·05)	0·03 (0·03 to 0·04)	0·17 (0·15 to 0·20)	0·13 (0·11 to 0·16)	68·83 (67·27 to 70·67)	73·02 (71·29 to 74·76)	17·09 (16·19 to 18·45)	19·98 (18·85 to 21·11)	4 (4 to 5)	3 (3 to 3)
Vietnam	0·02 (0·01 to 0·02)	0·01 (0·01 to 0·01)	0·20 (0·17 to 0·23)	0·08 (0·06 to 0·10)	69·98 (68·33 to 71·23)	79·16 (77·84 to 80·89)	17·15 (16·06 to 17·85)	22·79 (21·92 to 24·12)	349 (319 to 401)	258 (221 to 286)
Sub-Saharan Africa	**0·08 (0·08 to 0·09)**	**0·07 (0·07 to 0·08)**	**0·28 (0·27 to 0·29)**	**0·21 (0·20 to 0·22)**	**61·65 (60·79 to 62·42)**	**66·24 (65·38 to 67·02)**	**16·43 (16·06 to 16·74)**	**18·91 (18·47 to 19·35)**	**4072 (3922 to 4265)**	**3404 (3268 to 3563)**
Central sub-Saharan Africa	0·08 (0·07 to 0·10)	0·07 (0·06 to 0·08)	0·30 (0·27 to 0·33)	0·23 (0·21 to 0·26)	60·29 (58·66 to 62)	64·41 (62·7 to 65·98)	14·94 (14·3 to 15·86)	17·13 (16·04 to 18·17)	505 (460 to 556)	443 (404 to 488)
Angola	0·07 (0·06 to 0·08)	0·06 (0·05 to 0·07)	0·29 (0·24 to 0·33)	0·22 (0·18 to 0·25)	61·67 (59·67 to 63·96)	66·68 (64·5 to 68·9)	15·21 (14·48 to 16·44)	18·44 (16·91 to 19·96)	100 (88 to 115)	84 (73 to 96)
Central African Republic	0·13 (0·11 to 0·16)	0·12 (0·10 to 0·14)	0·52 (0·45 to 0·58)	0·38 (0·31 to 0·45)	49·11 (46·48 to 51·72)	54·91 (51·97 to 58·02)	11·92 (11·07 to 12·96)	14·24 (12·84 to 16·34)	36 (31 to 42)	28 (24 to 33)
Congo (Brazzaville)	0·06 (0·05 to 0·07)	0·05 (0·04 to 0·06)	0·29 (0·24 to 0·34)	0·31 (0·26 to 0·36)	62·55 (60·39 to 64·81)	62·7 (60·20 to 65·63)	15·6 (14·92 to 16·79)	15·87 (14·81 to 17·61)	18 (16 to 21)	19 (16 to 23)
Democratic Republic of the Congo	0·09 (0·07 to 0·10)	0·08 (0·07 to 0·09)	0·29 (0·25 to 0·34)	0·23 (0·19 to 0·27)	60·36 (58·19 to 62·67)	64·32 (62·01 to 66·69)	14·98 (14·08 to 16·33)	16·97 (15·45 to 18·43)	340 (298 to 389)	303 (266 to 345)
Equatorial Guinea	0·06 (0·05 to 0·07)	0·05 (0·04 to 0·06)	0·26 (0·20 to 0·32)	0·26 (0·20 to 0·32)	64·26 (61·26 to 67·1)	66·42 (62·61 to 70·52)	16·85 (15·17 to 18·74)	19·35 (16·38 to 22·62)	4 (3 to 5)	4 (3 to 5)
Gabon	0·04 (0·03 to 0·05)	0·03 (0·03 to 0·04)	0·26 (0·22 to 0·30)	0·16 (0·13 to 0·20)	65·08 (63·3 to 66·7)	72·07 (69·79 to 74·39)	15·84 (15·31 to 16·23)	19·96 (18·39 to 21·71)	6 (6 to 7)	5 (4 to 5)
Eastern sub-Saharan Africa	0·07 (0·06 to 0·08)	0·06 (0·05 to 0·06)	0·28 (0·27 to 0·29)	0·20 (0·19 to 0·21)	62·51 (61·74 to 63·26)	67·43 (66·77 to 68·11)	16·04 (15·76 to 16·32)	18·74 (18·38 to 19·09)	1412 (1365 to 1460)	1126 (1085 to 1165)
Burundi	0·09 (0·07 to 0·10)	0·07 (0·07 to 0·08)	0·31 (0·26 to 0·36)	0·24 (0·20 to 0·29)	59·69 (57·35 to 62·16)	63·58 (61·3 to 65·88)	14·74 (13·86 to 16·19)	16·31 (14·96 to 17·97)	46 (40 to 52)	36 (32 to 41)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Comoros	0·05 (0·04 to 0·06)	0·05 (0·04 to 0·05)	0·20 (0·16 to 0·23)	0·16 (0·13 to 0·20)	67·1 (65·04 to 69·21)	70·04 (67·84 to 72·28)	16·7 (15·69 to 18·04)	18·76 (17·22 to 20·23)	2 (2 to 3)	2 (2 to 3)
Djibouti	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·23 (0·18 to 0·29)	0·20 (0·16 to 0·26)	66·05 (63·13 to 68·79)	68·86 (65·27 to 72·01)	16·62 (15·14 to 18·43)	18·85 (16·52 to 21·08)	4 (3 to 5)	3 (2 to 4)
Eritrea	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·38 (0·32 to 0·45)	0·24 (0·19 to 0·30)	59·17 (56·42 to 61·93)	65·92 (63·4 to 68·97)	13·58 (12·66 to 14·79)	16·39 (15·29 to 18·17)	23 (19 to 27)	19 (16 to 22)
Ethiopia	0·06 (0·05 to 0·07)	0·05 (0·05 to 0·06)	0·20 (0·18 to 0·21)	0·15 (0·14 to 0·17)	66·66 (65·57 to 67·74)	70·38 (69·3 to 71·51)	17·37 (16·74 to 17·96)	19·66 (18·99 to 20·35)	308 (291 to 328)	229 (214 to 244)
Kenya	0·05 (0·04 to 0·06)	0·04 (0·03 to 0·05)	0·29 (0·28 to 0·31)	0·21 (0·20 to 0·23)	63·21 (62·44 to 63·94)	68·75 (67·94 to 69·55)	15·78 (15·53 to 16·06)	19·46 (19·05 to 19·9)	162 (156 to 167)	127 (123 to 132)
Madagascar	0·08 (0·07 to 0·09)	0·07 (0·06 to 0·08)	0·26 (0·21 to 0·32)	0·22 (0·18 to 0·27)	62·17 (59·75 to 64·82)	64·81 (62·28 to 67·54)	15·51 (14·38 to 17·14)	16·67 (15·16 to 18·48)	97 (81 to 116)	87 (74 to 103)
Malawi	0·07 (0·06 to 0·08)	0·06 (0·05 to 0·07)	0·34 (0·30 to 0·38)	0·22 (0·19 to 0·25)	59·6 (57·93 to 61·5)	66·93 (64·87 to 68·98)	15·09 (14·51 to 15·98)	19·42 (17·86 to 20·77)	72 (65 to 80)	57 (51 to 64)
Mozambique	0·08 (0·07 to 0·09)	0·07 (0·06 to 0·08)	0·44 (0·40 to 0·50)	0·29 (0·25 to 0·34)	54·82 (52·67 to 57·04)	61·99 (59·39 to 64·45)	13·77 (12·85 to 14·69)	17·25 (15·74 to 19·04)	142 (126 to 160)	114 (100 to 130)
Rwanda	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·22 (0·19 to 0·26)	0·16 (0·13 to 0·18)	65·75 (64·04 to 67·64)	70·83 (69·06 to 72·73)	16·22 (15·47 to 17·42)	19·61 (18·41 to 20·88)	36 (32 to 40)	32 (29 to 37)
Somalia	0·11 (0·09 to 0·14)	0·09 (0·08 to 0·11)	0·34 (0·28 to 0·42)	0·27 (0·22 to 0·34)	56·52 (53·67 to 59·32)	60·59 (57·74 to 63·27)	14·08 (12·83 to 15·66)	15·34 (13·65 to 17·05)	80 (63 to 103)	65 (52 to 83)
South Sudan	0·11 (0·09 to 0·13)	0·10 (0·08 to 0·11)	0·33 (0·27 to 0·41)	0·24 (0·19 to 0·32)	56·94 (53·94 to 59·97)	61·83 (58·63 to 65·14)	14·88 (13·34 to 16·51)	16·9 (14·82 to 18·87)	56 (47 to 67)	42 (35 to 50)
Tanzania	0·07 (0·05 to 0·08)	0·06 (0·05 to 0·07)	0·24 (0·21 to 0·27)	0·18 (0·15 to 0·20)	64·62 (62·89 to 66·27)	68·88 (67·18 to 70·58)	17·08 (16·07 to 17·92)	19·57 (18·5 to 20·56)	185 (166 to 207)	157 (141 to 177)
Uganda	0·07 (0·06 to 0·08)	0·05 (0·05 to 0·06)	0·28 (0·24 to 0·32)	0·17 (0·15 to 0·20)	62·28 (60·50 to 64·15)	69·17 (67·2 to 71·13)	15·71 (14·9 to 17·01)	19·68 (18·34 to 20·93)	131 (119 to 146)	102 (91 to 115)
Zambia	0·07 (0·06 to 0·09)	0·05 (0·05 to 0·06)	0·32 (0·29 to 0·36)	0·23 (0·20 to 0·26)	60·36 (58·52 to 62·34)	66·28 (64·46 to 68·35)	15·33 (14·76 to 16·29)	18·38 (17·08 to 19·86)	68 (60 to 76)	51 (45 to 57)
Southern sub-Saharan Africa	0·04 (0·04 to 0·05)	0·04 (0·03 to 0·04)	0·37 (0·35 to 0·38)	0·25 (0·23 to 0·27)	61·5 (60·75 to 62·18)	68·49 (67·57 to 69·33)	16·81 (16·59 to 17·02)	20·98 (20·65 to 21·28)	355 (343 to 368)	305 (292 to 319)
Botswana	0·03 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·28 (0·23 to 0·35)	0·21 (0·18 to 0·26)	67·03 (64·14 to 69·19)	70·97 (68·75 to 72·48)	18·15 (16·59 to 18·94)	20·01 (18·92 to 20·85)	7 (6 to 9)	7 (6 to 8)
Lesotho	0·08 (0·07 to 0·09)	0·06 (0·05 to 0·07)	0·57 (0·51 to 0·62)	0·37 (0·31 to 0·43)	50·27 (48·13 to 52·65)	59·32 (56·33 to 62·67)	12·21 (11·47 to 13·06)	16·64 (14·87 to 19·24)	14 (12 to 16)	11 (9 to 14)
Namibia	0·04 (0·04 to 0·05)	0·03 (0·03 to 0·04)	0·33 (0·28 to 0·38)	0·21 (0·16 to 0·27)	62·33 (60·28 to 64·31)	70·70 (67·46 to 73·54)	15·73 (15·17 to 16·2)	21·46 (19·66 to 23·14)	10 (9 to 11)	7 (6 to 9)
South Africa	0·04 (0·03 to 0·04)	0·03 (0·03 to 0·04)	0·36 (0·34 to 0·38)	0·25 (0·23 to 0·27)	62·8 (61·99 to 63·56)	69·69 (68·6 to 70·62)	17·51 (17·35 to 17·66)	21·88 (21·69 to 22·06)	255 (245 to 266)	221 (210 to 233)
Swaziland (eSwatini)	0·05 (0·04 to 0·06)	0·04 (0·03 to 0·05)	0·49 (0·43 to 0·55)	0·28 (0·23 to 0·33)	54·92 (52·57 to 57·56)	65·15 (62·13 to 68·35)	13·22 (12·38 to 14·44)	18·52 (16·35 to 20·95)	6 (5 to 7)	4 (4 to 5)
Zimbabwe	0·06 (0·05 to 0·07)	0·05 (0·04 to 0·06)	0·40 (0·35 to 0·44)	0·27 (0·23 to 0·31)	58·15 (56·31 to 60·10)	64·39 (62·13 to 66·6)	14·13 (13·2 to 15·09)	16·97 (15·55 to 18·57)	64 (57 to 71)	54 (47 to 62)
Western sub-Saharan Africa	0·10 (0·09 to 0·11)	0·09 (0·08 to 0·10)	0·25 (0·23 to 0·28)	0·20 (0·18 to 0·23)	61·7 (60·16 to 62·94)	65·33 (63·57 to 66·85)	17·07 (16·26 to 17·69)	18·87 (17·81 to 19·87)	1801 (1674 to 1972)	1531 (1414 to 1681)
Benin	0·09 (0·08 to 0·11)	0·08 (0·07 to 0·09)	0·24 (0·19 to 0·29)	0·18 (0·14 to 0·22)	62·61 (60·09 to 65·03)	66·63 (64·19 to 69·09)	16·4 (14·89 to 17·69)	18·4 (16·74 to 20·04)	43 (37 to 51)	37 (32 to 43)
Burkina Faso	0·12 (0·10 to 0·14)	0·10 (0·08 to 0·11)	0·28 (0·25 to 0·32)	0·19 (0·17 to 0·22)	58·94 (56·92 to 61·04)	64·38 (62·57 to 66·3)	15·41 (14·42 to 16·4)	17·74 (16·61 to 18·89)	100 (88 to 117)	82 (73 to 94)
Cameroon	0·08 (0·07 to 0·09)	0·07 (0·06 to 0·08)	0·30 (0·25 to 0·35)	0·24 (0·20 to 0·28)	60·97 (58·62 to 63·46)	65·1 (62·69 to 67·82)	15·7 (14·45 to 17·31)	18·22 (16·36 to 20)	104 (90 to 119)	87 (75 to 101)
Cape Verde	0·02 (0·02 to 0·03)	0·02 (0·02 to 0·02)	0·19 (0·17 to 0·21)	0·09 (0·08 to 0·10)	72·52 (71·26 to 73·75)	79·01 (78·23 to 80·06)	21·18 (20·49 to 21·95)	23·98 (23·63 to 24·72)	2 (1 to 2)	1 (1 to 1)
Chad	0·12 (0·11 to 0·14)	0·11 (0·10 to 0·13)	0·28 (0·24 to 0·33)	0·23 (0·19 to 0·27)	58·6 (56·43 to 60·82)	61·64 (59·19 to 64·23)	15·8 (14·55 to 16·93)	17·08 (15·68 to 18·51)	80 (71 to 91)	67 (59 to 75)

(Table continues on next page)

	Probability of death between birth and age 5 years		Probability of death between ages 15 and 60 years		Life expectancy at birth (years)		Life expectancy at age 60 years (years)		Total deaths (thousands)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(Continued from previous page)										
Côte d'Ivoire	0·09 (0·08 to 0·11)	0·07 (0·06 to 0·08)	0·30 (0·26 to 0·34)	0·22 (0·19 to 0·26)	60·10 (57·82 to 62·32)	65·31 (62·84 to 67·7)	15·83 (14·5 to 17·06)	18·06 (16·59 to 19·68)	108 (95 to 122)	77 (67 to 87)
The Gambia	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·27 (0·23 to 0·32)	0·21 (0·17 to 0·25)	63·78 (62·03 to 65·79)	67·87 (65·62 to 70·16)	15·67 (15·19 to 16·42)	17·88 (16·38 to 19·43)	7 (7 to 8)	6 (5 to 7)
Ghana	0·06 (0·05 to 0·07)	0·05 (0·04 to 0·06)	0·28 (0·25 to 0·32)	0·20 (0·17 to 0·23)	62·59 (60·95 to 64·33)	68·4 (66·65 to 70·28)	15·36 (14·83 to 16·2)	18·64 (17·37 to 19·94)	111 (100 to 122)	91 (80 to 102)
Guinea	0·10 (0·09 to 0·13)	0·09 (0·08 to 0·10)	0·29 (0·26 to 0·33)	0·25 (0·21 to 0·28)	59·26 (57·22 to 61·36)	62·23 (60·32 to 64·18)	15·09 (14·07 to 16·27)	16·28 (15·14 to 17·53)	58 (52 to 65)	51 (46 to 57)
Guinea-Bissau	0·08 (0·07 to 0·10)	0·07 (0·06 to 0·07)	0·38 (0·32 to 0·43)	0·28 (0·24 to 0·32)	57·36 (55·12 to 59·67)	62·63 (60·33 to 64·94)	13·99 (12·98 to 14·89)	16·1 (14·72 to 17·86)	8 (7 to 10)	7 (6 to 8)
Liberia	0·08 (0·07 to 0·10)	0·07 (0·06 to 0·08)	0·24 (0·20 to 0·28)	0·22 (0·18 to 0·26)	63·7 (61·52 to 65·79)	65·11 (63·13 to 67·43)	16·89 (15·5 to 17·99)	17·4 (15·96 to 19)	16 (14 to 19)	15 (13 to 17)
Mali	0·13 (0·11 to 0·15)	0·11 (0·10 to 0·12)	0·22 (0·19 to 0·26)	0·21 (0·17 to 0·24)	60·96 (58·73 to 63·17)	62·98 (61·06 to 64·87)	17·37 (16·36 to 18·6)	17·89 (16·66 to 19·17)	101 (87 to 117)	86 (76 to 97)
Mauritania	0·05 (0·04 to 0·06)	0·04 (0·04 to 0·05)	0·15 (0·12 to 0·18)	0·15 (0·12 to 0·19)	70·04 (68·03 to 72·26)	71·01 (68·91 to 73·02)	18·64 (17·39 to 20·26)	19·11 (17·65 to 20·48)	10 (9 to 12)	10 (8 to 11)
Niger	0·11 (0·09 to 0·14)	0·10 (0·09 to 0·12)	0·24 (0·20 to 0·28)	0·20 (0·16 to 0·24)	61·13 (58·83 to 63·48)	63·59 (61·39 to 65·95)	16·56 (15·47 to 17·7)	17·63 (16·22 to 19·06)	92 (79 to 108)	81 (71 to 92)
Nigeria	0·11 (0·10 to 0·12)	0·10 (0·08 to 0·11)	0·23 (0·19 to 0·28)	0·19 (0·15 to 0·25)	62·76 (59·7 to 65·2)	65·82 (62·32 to 69·11)	18·55 (16·62 to 19·91)	20·09 (17·61 to 22·73)	847 (724 to 1015)	736 (623 to 879)
São Tomé and Príncipe	0·03 (0·03 to 0·04)	0·02 (0·02 to 0·03)	0·20 (0·17 to 0·23)	0·16 (0·13 to 0·18)	68·09 (66·51 to 69·83)	71·77 (70·06 to 73·78)	16·77 (16·09 to 17·78)	18·83 (17·7 to 20·26)	1 (<1 to 1)	<1 (<1 to 1)
Senegal	0·05 (0·05 to 0·06)	0·04 (0·04 to 0·05)	0·21 (0·18 to 0·25)	0·17 (0·14 to 0·20)	66·14 (64·5 to 67·87)	70·05 (68·32 to 71·93)	16·45 (15·54 to 17·51)	18·83 (17·58 to 20·03)	48 (43 to 54)	40 (35 to 45)
Sierra Leone	0·12 (0·10 to 0·14)	0·10 (0·09 to 0·12)	0·27 (0·22 to 0·31)	0·24 (0·20 to 0·29)	59·47 (57·21 to 61·72)	61·38 (59·4 to 63·73)	16·04 (14·86 to 17·16)	16·45 (15·14 to 17·89)	37 (32 to 43)	34 (30 to 38)
Togo	0·07 (0·06 to 0·09)	0·06 (0·05 to 0·07)	0·30 (0·25 to 0·35)	0·20 (0·16 to 0·24)	61·37 (59·06 to 63·8)	67·23 (64·96 to 69·62)	15·36 (14·41 to 16·76)	18·54 (16·93 to 20·16)	27 (24 to 31)	23 (20 to 27)

Data in parentheses are 95% uncertainty intervals. Super-regions, regions, and countries are listed in alphabetical order. SDI=Socio-demographic Index.

***Table:* Life expectancy at birth and at age 60 years, probability of death between birth and age 5 years, probability of death between ages 15 and 60 years, and total number of deaths, for countries and territories and subnational units in the UK, by sex, 2017**

2·7 years (0·7 to 5·0) lower for men and 5·0 years (3·5–6·6) lower for women compared with Japan. By 2017, the gap between these two countries had increased to 14·5 years (12·5–16·5) for men and 14·0 years (12·3–16·0) for women because the Philippines has experienced much smaller gains compared with most other large countries.

Despite the massive setback around the famine in 1960, China has made steady progress and, in 2017, life expectancy was 74·5 years (95% UI 74·1 to 75·0) for men and 79·9 years (79·4 to 80·4) for women. Among the world's most populous countries, Japan has had the highest life expectancy for men and women since 1963 and continues to do so in 2017. A worrying finding shown in figure 6B is that, in both Mexico and the USA, men have had declines in life expectancy since 2012. Women in these two countries have not had declines, although their gains in life expectancy have not been significantly different from zero (0·01 years [–0·28 to 0·26] in Mexico and –0·11 years [–0·4 to 0·18] in the USA) since 2010.

Figure 7 shows life expectancy at birth in 2017 and the net change in life expectancy at birth between 1950 and 2017, by sex. Country-specific estimates for 2017 are also shown in the table, which provides several summary measures of mortality in 2017. Appendix 2 includes results for 5-year age groups. There was enormous variation in life expectancy and death rates around the world in 2017. Across all countries, life expectancy at birth ranges from 49·1 years (95% UI 46·5–51·7) in the Central African Republic to 82·1 years (81·5–82·8) in Switzerland among men and from 54·9 years (52·0–58·0) in Central African Republic to 87·6 years (86·9–88·1) in Singapore among women. Three countries, the Central African Republic, Lesotho, and Mozambique, had life expectancies in 2017 that were lower than that of Singapore in 1950 for both men (53·5 years) and women (60·2 years).

There has also been marked heterogeneity across the world in gains in life expectancy at birth since 1950, as shown in figure 7C (females) and figure 7D (males). For men, 13 countries have achieved gains in life expectancy of

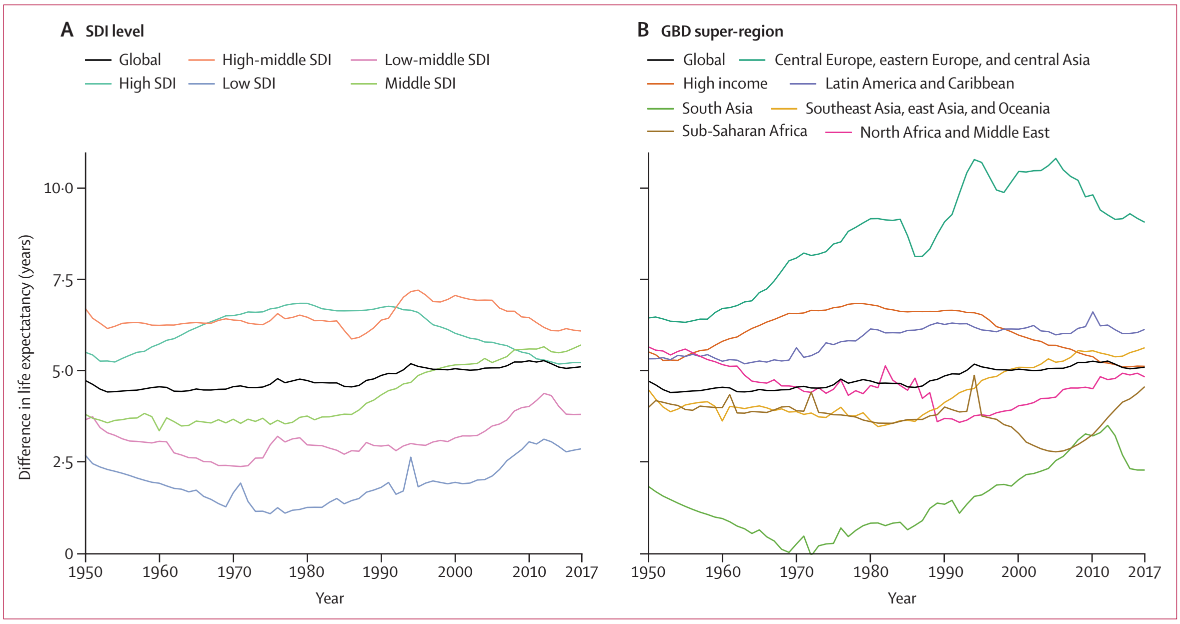


Figure 8: **Difference in life expectancy at birth between females and males for SDI (A) and GBD super-region (B), 1950–2017**
Each line represents the difference in life expectancy between females and males (female life expectancy minus male life expectancy) for a given SDI level in 2017 (A) and GBD super-region (B), for each year between 1950 and 2017. SDI=Socio-demographic Index. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study.

35 years or more since 1950: North Korea, Maldives, Myanmar, Timor-Leste, South Korea, Peru, Iran, Jordan, Oman, Tunisia, Turkey, Yemen, and Bhutan. The countries that have achieved gains in life expectancy of less than 10 years since 1950 for men include six countries in eastern and central Europe (Montenegro, Belarus, Latvia, Lithuania, Russia, Ukraine), as well as Fiji, Andorra, Denmark, Israel, the Netherlands, Uruguay, Central African Republic, Seychelles, Lesotho, South Africa, Zimbabwe, American Samoa, Guam, and the Northern Mariana Islands. For women, 11 countries have achieved gains in life expectancy of 35 years or more since 1950: these are the Maldives, Timor-Leste, South Korea, Bolivia, Peru, Nicaragua, Iran, Jordan, Oman, Yemen, and Bhutan. The countries that have achieved gains in life expectancy of less than 10 years for women since 1950 include Belarus, Latvia, Russia, Ukraine, Andorra, the USA, Lesotho, Zimbabwe, American Samoa, Guam, and the Northern Mariana Islands.

Differences in mortality experience between women and men

Figure 8 shows the trend over time in the gap between women and men for life expectancy at birth by SDI quintiles (figure 8A) and by super-region (figure 8B). Globally, the gap has remained fairly stable over the past 68 years, increasing from 4·7 years (95% UI 4·2–5·4) in 1950 to 5·1 years (4·9–5·3) in 2017, but with a lot of variation across SDI quintiles and regions. Across all SDI quintiles, female life expectancy was higher than male life expectancy for all years since 1950, with the gap being larger as level of development increases in 1950, but with variable trends across SDI quintiles over time. Overall, there appears to be an increasing gap between women and men that at some point starts to shrink. The shrinking occurs at different points in time across levels of development: for high-SDI countries, the gap between women and men has been decreasing since 1990, for high-middle SDI countries since 2000, and in the lower three quintiles of SDI, the gap has been decreasing since about 2010. In 2017, the gap ranged between 6·1 years (5·6–6·5) among high-middle SDI countries to 2·9 years (2·3–3·4) among low-SDI countries.

Figure 8B shows the heterogeneous trends in the gap between female and male life expectancy over time and across super-regions. The male disadvantage is substantially larger in central Europe, eastern Europe, and central Asia than in other super-regions, and has been consistently so since 1950; the gap in this region increased between 1950 and 2005, and has been decreasing since then but remains the largest across all regions: in 2017, women in central Europe, eastern Europe, and central Asia had a life expectancy that was 9·1 years (95% UI 8·9 to 9·3) greater than that of men. The next largest gap was in Latin America and the Caribbean, where female life expectancy was 6·1 years (5·8 to 6·5) greater than that of males in 2017. The gap had been increasing between 1950 and 2010 in this region, but has remained relatively constant since 2000. A similar pattern occurred in high-income countries, but the shrinking of the gap occurred earlier in this region, peaking in 1979 when it was 6·8 years (6·8 to 6·9) and dropping to 5·1 years (4·9 to 5·4) in 2017. Sub-Saharan Africa had very little change in the gap between female and male life

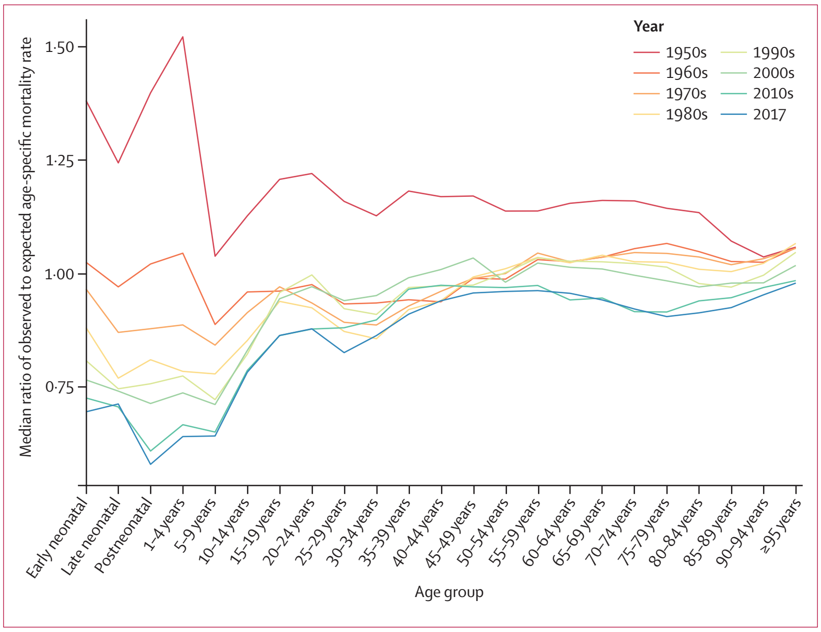


***Figure 9*: Median observed to expected ratio of age-specific mortality rate, globally, for both sexes combined, in the 1950s, 1960s, 1970s, 1980s, 1990s, 2000s, 2010s, and 2017**

Each line represents the median ratio across locations for each decade of the observed age-specific mortality rate to that expected on the basis of SDI, for each of the 23 GBD age groups. The early neonatal age group is 0–6 days, late neonatal is 7–27 days, and postneonatal 28–364 days. SDI=Socio-demographic Index. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study.

expectancy between 1950 and 1997, followed by a reduction until 2005 and then a steady increase since then. In North Africa and the Middle East the gap between female and male life expectancy had been decreasing continuously between 1950 and 1989 but has been increasing since. Male disadvantage in southeast Asia, east Asia, and Oceania tended to decrease between 1950 and 1981, and has been increasing or staying flat since. South Asia, the region with the smallest gap throughout this time period, has had two reversals in the trend. The smallest gap was in 1972, with a difference of only –0·04 years (–0·8 to 0·8) between female and male life expectancy, which then increased until 2012 and has decreased since; in 2017 the gap in south Asia, which is the smallest of any of the super-regions, was 2·3 years (1·9 to 2·8).

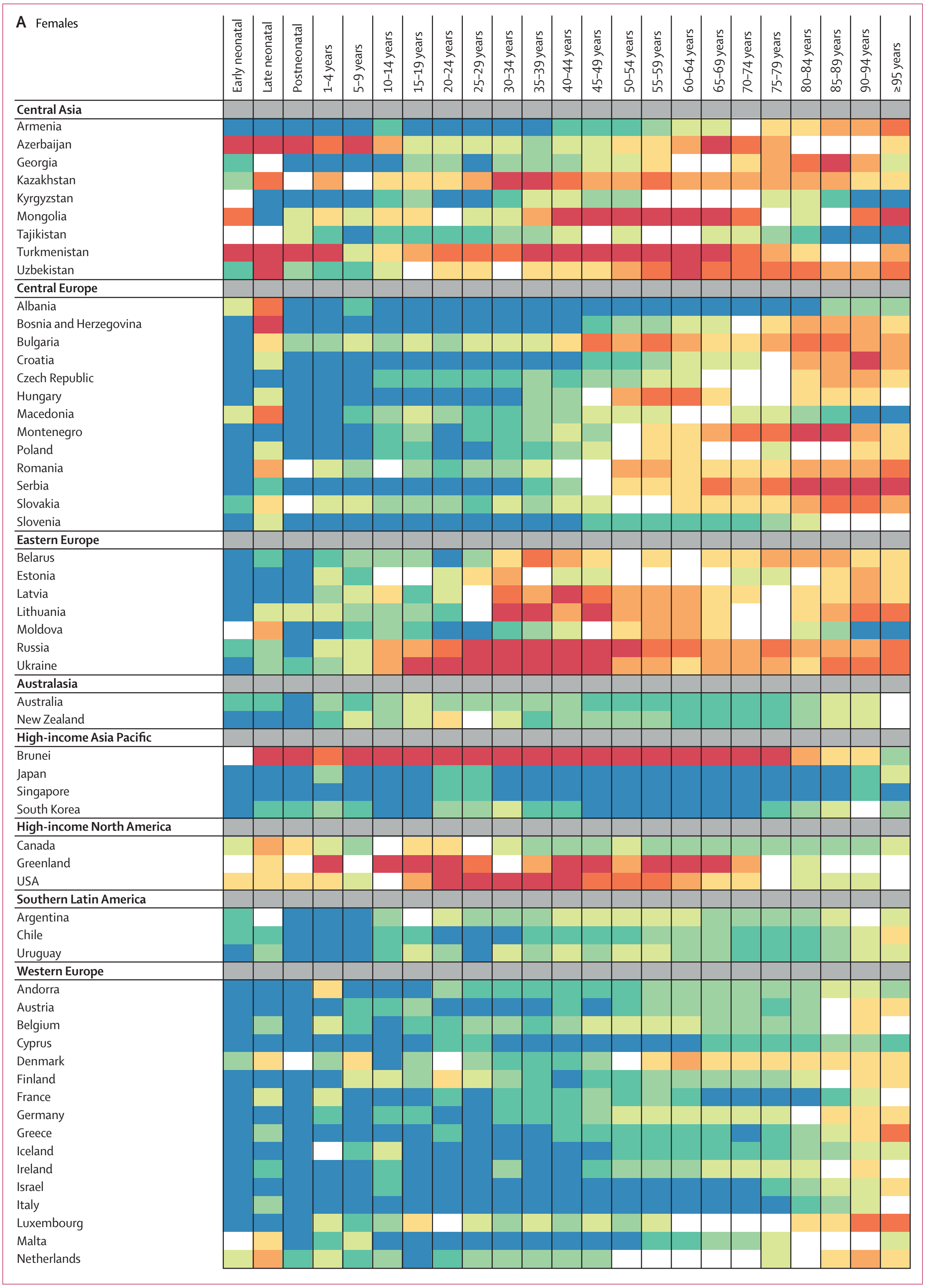
Observed versus expected life expectancy

Figure 9 shows the median value within each decade of the ratio between the observed age-specific mortality rates and what we refer to as expected mortality rates, which represent the mortality rates that would be anticipated on the basis of development status approximated by SDI, for each age group, and how that ratio has changed over time. For the younger age groups, particularly those younger than 5 years, there is a wide range in the ratio of observed to expected mortality rates across the eight time periods shown in the figure. In the earlier time periods, starting at 1950, the ratio of observed to expected mortality was highest for children younger than 10 years, suggesting that more children were dying than would be expected based on the level of development. Over time, that ratio shrinks substantially. The biggest change over time was in the 1–4 years age group, for which the median ratio of observed to expected life expectancy went from 1·52 (95% UI 1·04–2·03) in 1950 to 0·77 (0·63–0·90) in 1990 and 0·64 (0·52–0·77) in 2017. The effect of time was much more pronounced for the younger age groups. Among young adults and older adults (about 15–64 years), the trend over time was less clear and the range in the ratio of observed to expected age-specific mortality rates was much smaller than for younger age groups. Among the older age groups, the ratio has been close to 1 and only small decreases and increases have occurred after age 80 years over the 68 years covered by this study.

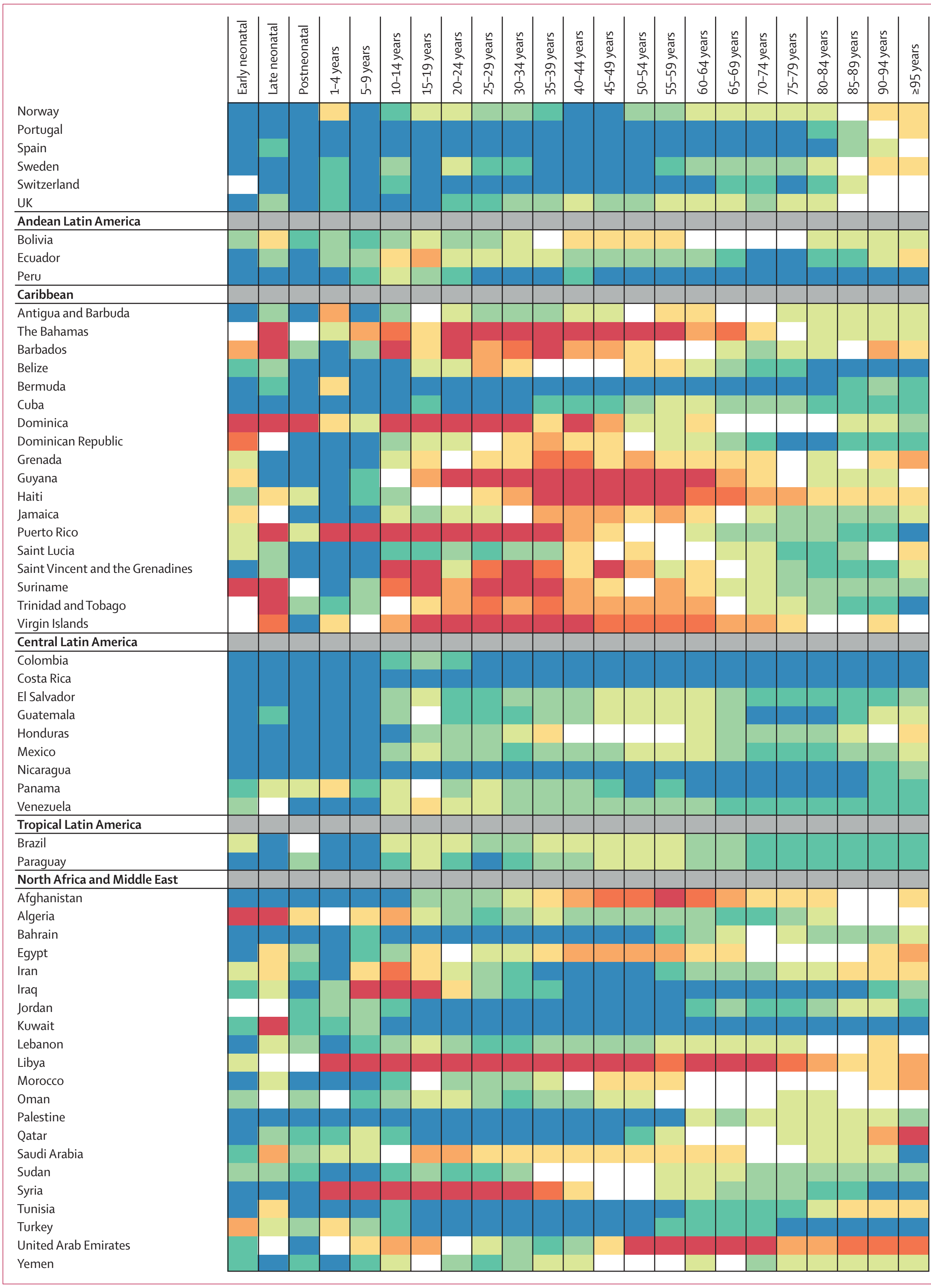
As well as varying over time, the way in which observed mortality levels correspond to those expected on the basis of development also varied substantially across countries, as represented in figure 10, which shows the 2017 values.

Figure 10A explores the relationship of observed mortality rate with SDI for women. There are 24 high-performing countries for women, where the ratio of observed to expected mortality rate was lower than 0·95 across all 23 age groups in the analysis. The list overlaps heavily with that for men and has several countries that performed better for women than men, including Colombia, Mexico, and Uruguay. China did very well for women, except between the ages of 5 and 14 years, but in Indonesia, age-specific mortality rates for women are higher than expected for most age groups, with the exception of child age groups, whereas for men, Indonesia performed much better. India had higher than expected mortality for almost all age groups, and particularly for early neonatal and reproductive ages. The USA stands out as having higher than expected rates in most age groups for women, particularly during the neonatal period and during reproductive years, and mortality rates were higher than expected until the age of 70 years. As also seen among men, much higher than expected mortality rates occurred in adult women aged 15–69 years in several countries in Oceania, including Fiji, Kiribati, the Marshall Islands, Micronesia, Papua New Guinea, the Solomon Islands, and Vanuatu. In several countries in eastern Europe, adult women had mortality rates that were more than 1·35 times what would be expected. In the Ukraine and Russia, the high mortality rates start at the age of 10 years and continue throughout adulthood. A similarly worrying pattern was present in many countries in sub-Saharan Africa, where women had much higher mortality rates than expected for the reproductive age groups. In some countries, such as Congo (Brazzaville), Equatorial Guinea, Gabon, Ghana, Nigeria, Lesotho, and South Africa, mortality rates were also high for girls under the age of 5 years.

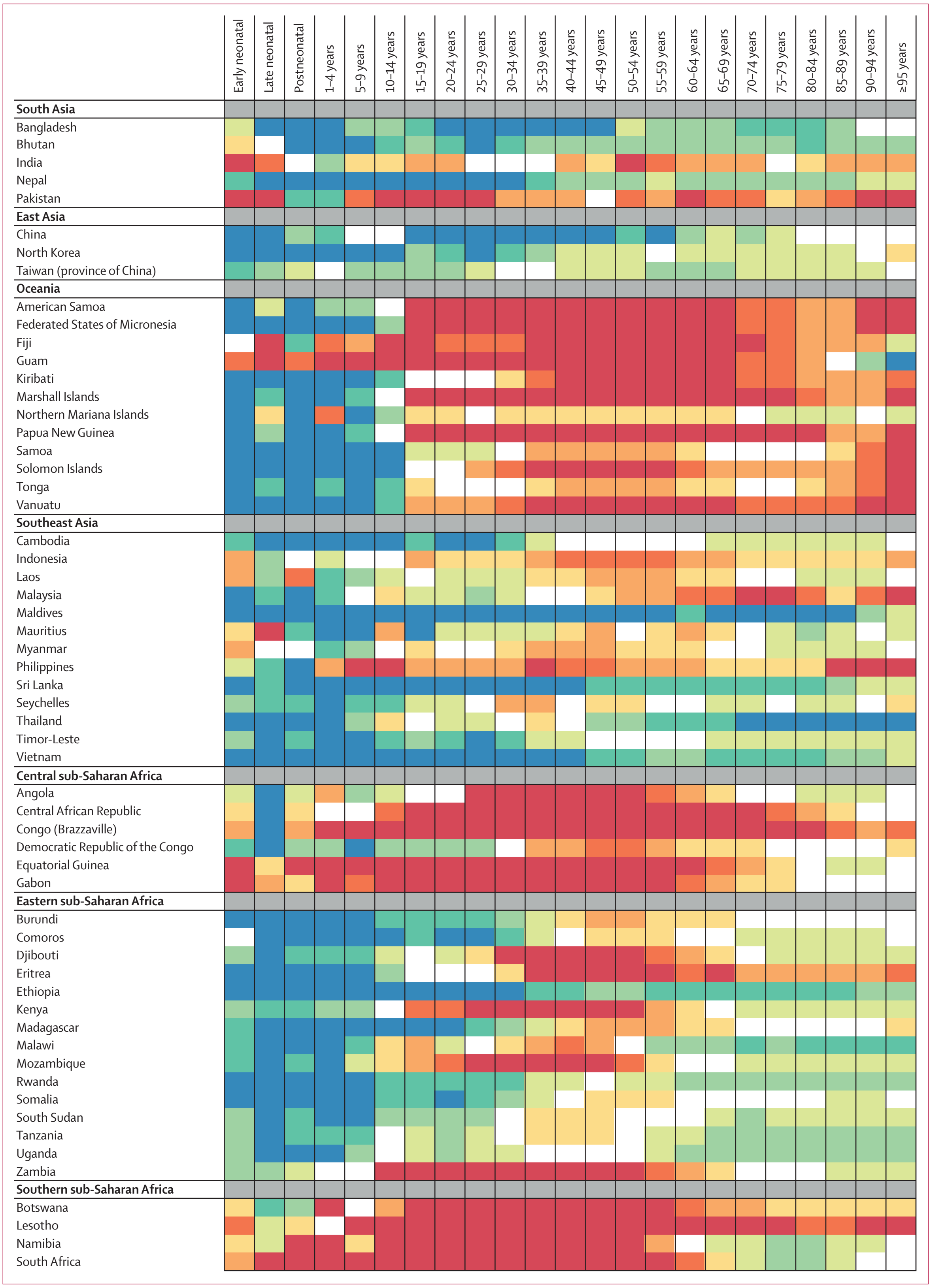
In figure 10B, which shows the results for males, there are 16 high-performing countries for which the ratio of observed to expected mortality rates was lower than 0·95 across the 23 age groups in the analysis. These



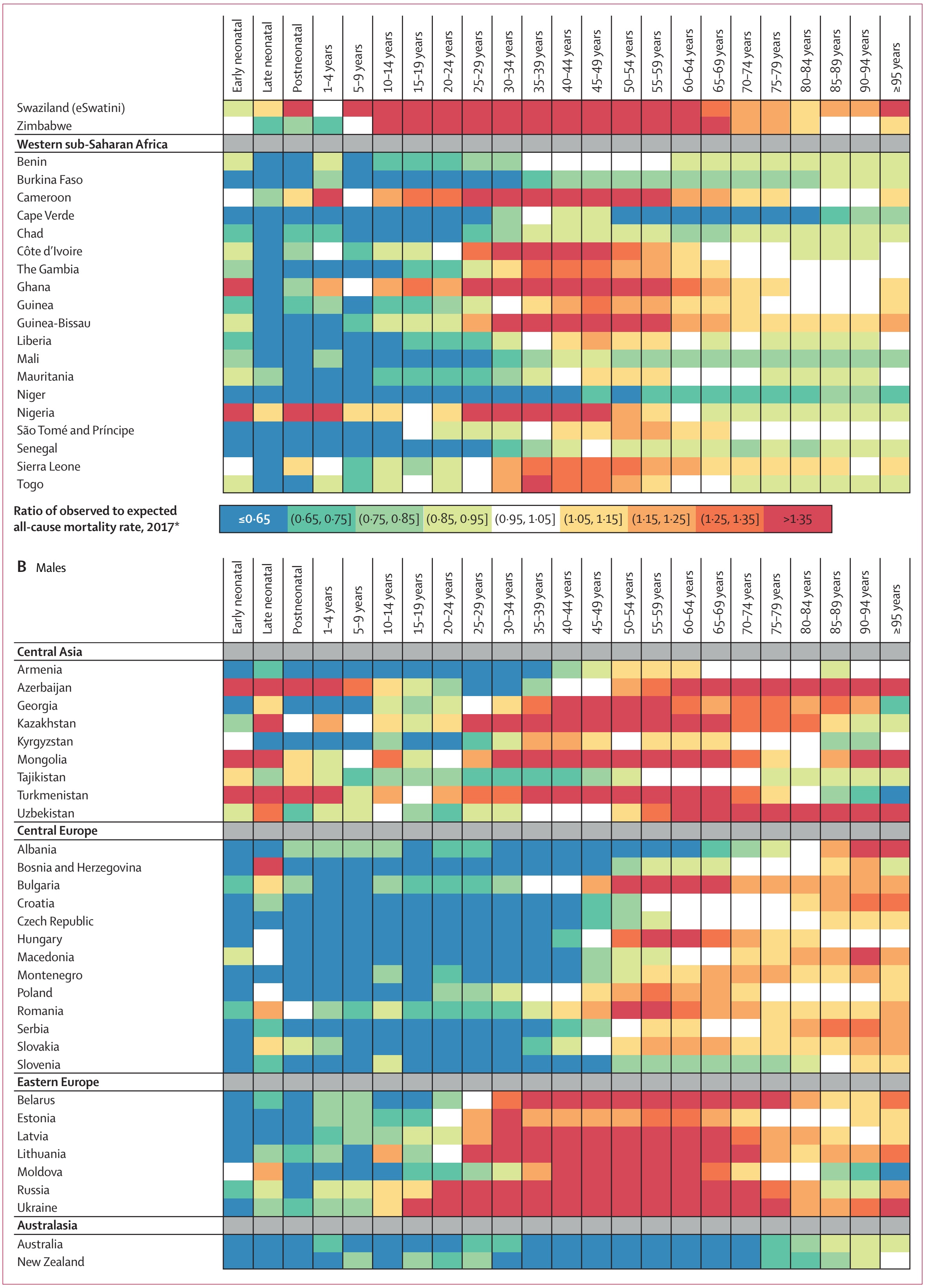
(Figure 10 continues on next page)



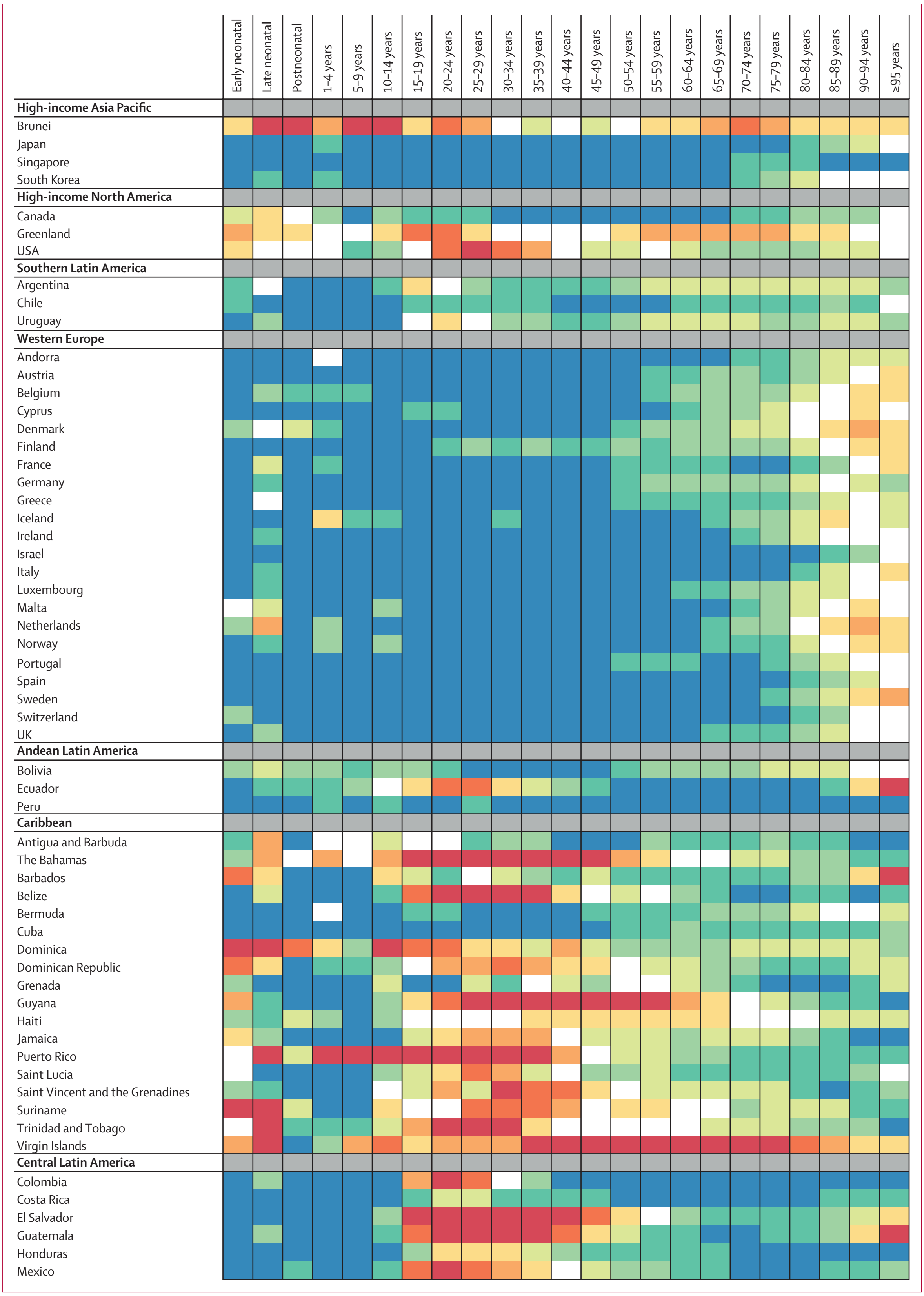
(Figure 10 continues on next page)



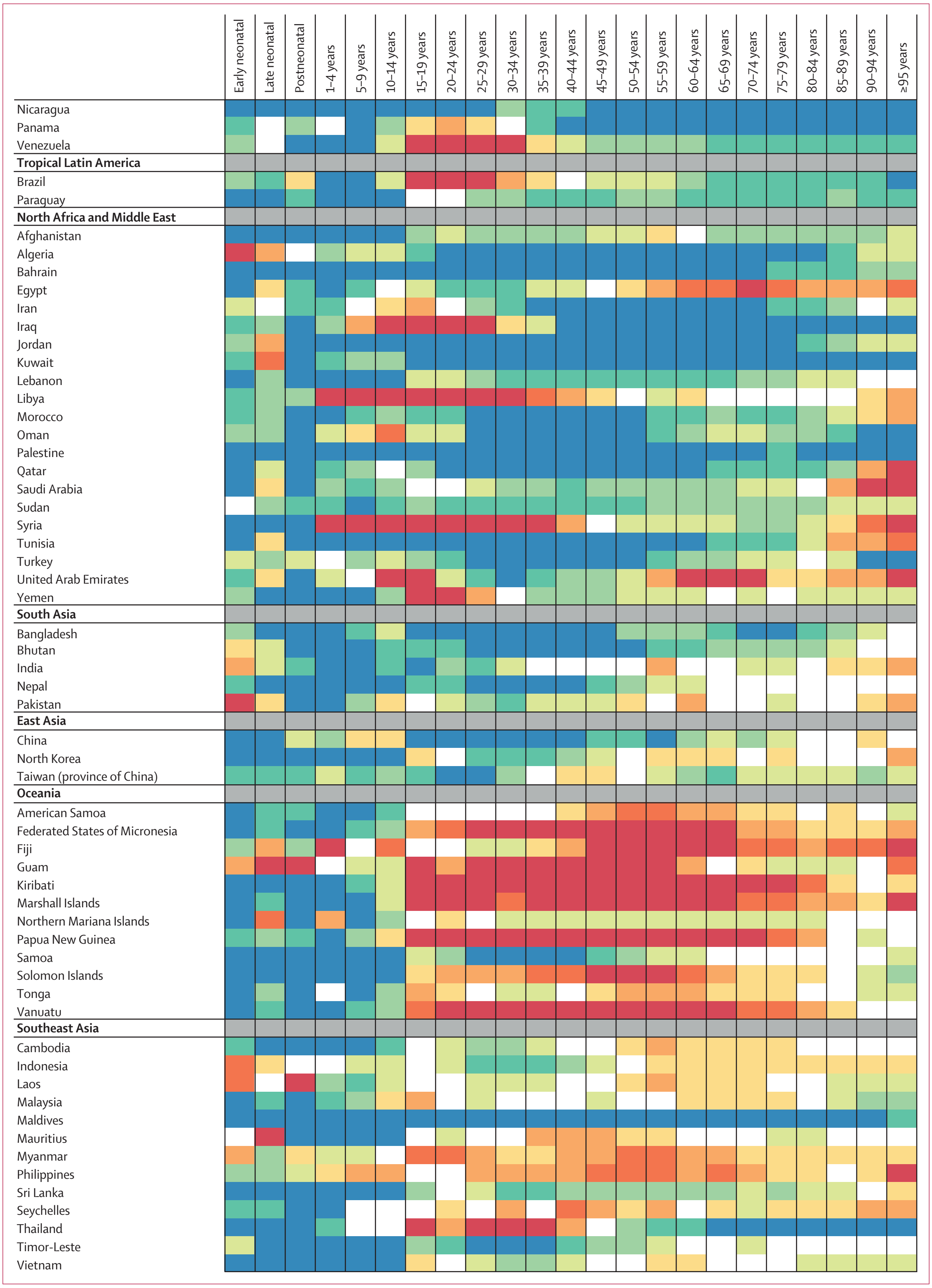
(Figure 10 continues on next page)



(Figure 10 continues on next page)



(Figure 10 continues on next page)



(Figure 10 continues on next page)

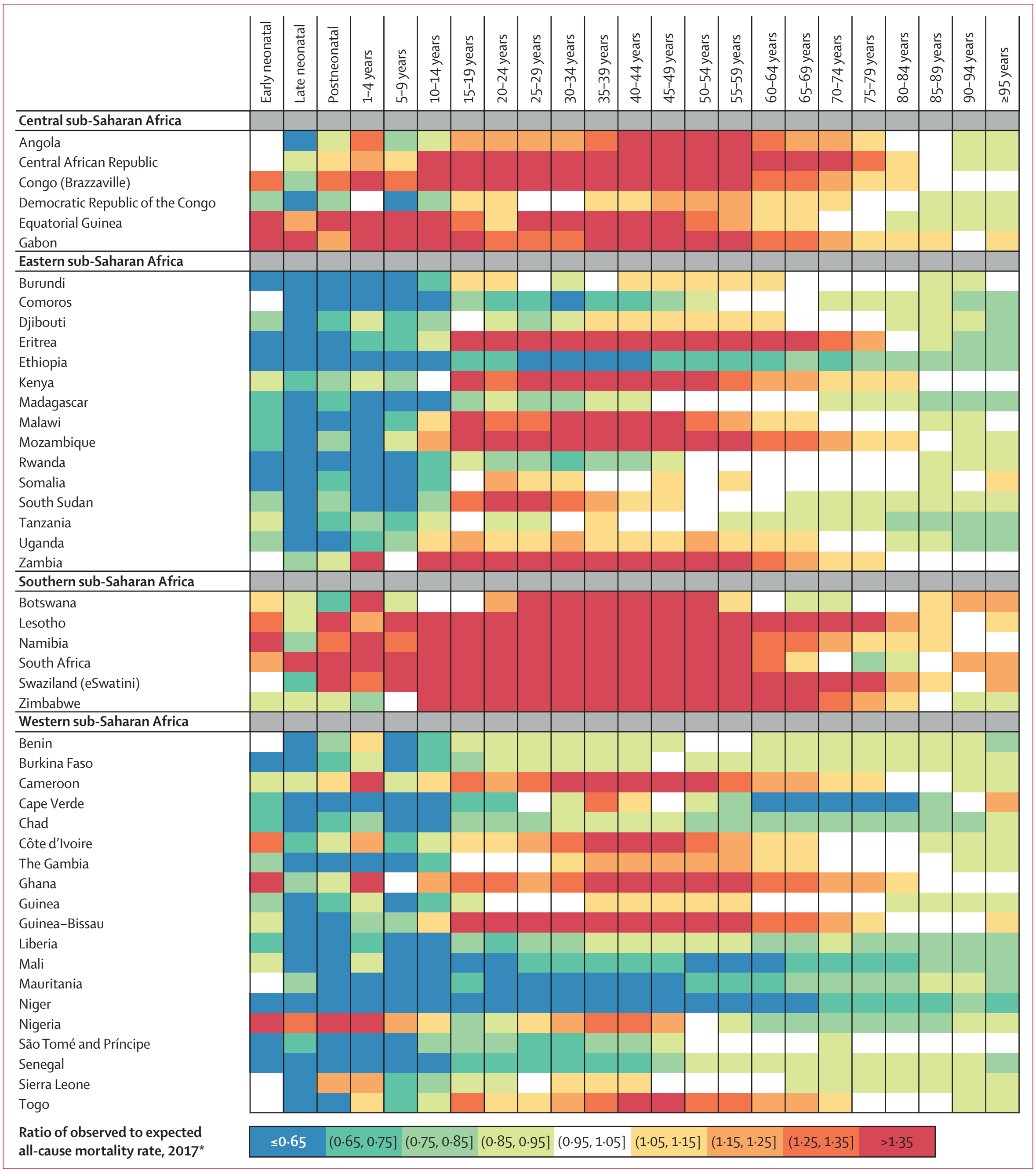


Figure 10: **Age-specific, all-cause mortality rate with the ratio of observed to expected by SDI, 2017**
Each square represents the ratio of the observed all-cause mortality rate to that expected on the basis of SDI for females (A) and males (B) for that given location, sex, and age group. The early neonatal age group is 0–6 days, late neonatal is 7–27 days, and postneonatal 28–364 days. SDI=Socio-demographic Index. *Round brackets indicate excluded endpoints whereas square brackets indicate included endpoints.

countries include some high-income countries that are known to have low mortality, such as Australia and Singapore, as well as countries in other regions that have low observed to expected ratios but do not necessarily have low mortality across all ages, such as Cuba, Nicaragua, and Peru in Latin America and the Caribbean; Ethiopia, Chad, Liberia, Niger, and Senegal in sub-Saharan Africa; the Maldives in southeast Asia; and Bahrain and Palestine in north Africa and the Middle East. Figure 10B also shows that several countries in eastern Europe and sub-Saharan Africa had very high mortality rates for young adult males, greater than 1·35 times what would be expected from their level of development. The Central African Republic and

Lesotho stand out as two countries with age-specific mortality rates that are as expected or higher than expected for their level of development across all 23 age groups. In sub-Saharan Africa, while there was variation across countries, the ages most affected were 15–59 years, whereas in Europe, these were mostly ages 25–69 years. Mortality rates were also very high among young adult men in Oceania, including Kiribati, the Marshall Islands, Micronesia, Papua New Guinea, and Vanuatu, as well as some Caribbean and Latin American countries such as the Bahamas, Belize, Guyana, Trinidad and Tobago, Puerto Rico, El Salvador, Guatemala, Venezuela, and Brazil. Among the most populous countries, China had lower than expected mortality rates in all age groups except children aged 5–9 years and adults older than 80 years. Conversely, the USA has higher than expected mortality rates between the ages of 20 and 40 years, with ratios greater than 1·05 for these age groups. The results for India and Pakistan were generally as expected except for early neonatal ages in Pakistan and early neonatal to young adult ages in India, whereas Bangladesh performed better than or as expected for all age groups. Nigeria performed worse than expected in under-5 mortality and in young adults and better than expected in older age groups.

Discussion

Main findings

This study represents the first comprehensive analysis of age-sex-specific death rates for single calendar years and single-year age groups for 195 countries and territories from 1950 to 2017. Our results show the remarkable variation in mortality rates over time and across countries. The decline in death rates has been the greatest in the age groups younger than 5 years, followed by young adults, and has been slower among older adults. Rising death rates have occurred in conflicts, natural disasters, large HIV epidemics, and in several locations such as eastern Europe, some countries in southeast Asia and Latin America, and most recently, in the USA. Increases in adult mortality rates even as child death rates fall are stark reminders that the drivers of adult mortality can be complex. Because of the celebrated progress in many locations, many people have come to expect age-specific death rates to always decline; however, there is nothing inevitable about the trajectory of death rates, particularly in adults.

Cross-cutting themes

A long-running theme in the demographic literature has been the balance between development and technology innovation as determinants of mortality change. Thomas McKeown,[46] examining declines in mortality in the UK in the first half of the 20th century, argued that health technology played little role and mortality decline in that setting was driven by improvements in the standard of living. Samuel Preston,[47] in a series of classic studies, roughly assigned one-third of life expectancy improvement to rising income per capita, one-third to improvements in educational attainment, and one-third to changes correlated with time, which he assigned to technology improvement. Given the wide array of drugs, vaccines, and procedures and understanding of risk factors that have emerged in the past 50 years, often with strong causal evidence such as randomised trials, major temporal shifts unexplained by development should be expected. These reductions in mortality with time, even after controlling for development, might be due to a broader array of social and other determinants aside from health-enhancing technologies. Declines are not inevitable: adverse trends such as the obesity epidemic, the opioid crisis, or the rise of drug-related violence in some locations could lead to shifts over time in the opposite direction.[9–11,16] Our analysis of observed and expected death rates provides some insight into these shifts. On average, we found considerable temporal shifts toward lower death rates, controlling for SDI, in age groups younger than 20 years. The analysis of observed death rates to those expected on the basis of SDI alone suggests that child death rates are nearly a third lower today than they were in 1950; this is most likely because of technology shifts or risk factor changes correlated with time. At older ages—ie, older than 60 years—the technology shift is more modest. In the range from ages 20 to 50 years, there was much less evidence of major changes over time, and in fact during the 1990s, the trend was in the opposite direction, possibly because of the HIV epidemic, the rise of mortality in the former Soviet Union, and increases in adult death rates in other countries, possibly related to drug use and suicide. By examining the role of temporal shifts, which can be a combination of technology change, the development of risk factor trends by age, and other social determinants instead of life expectancy, we have highlighted that progress for younger adults has not been as sensitive to new technologies. Understanding these patterns is important for prioritising the investments by societies in innovation as a means to improve health in different age groups.

Our study shows how remarkable the decline in under-5 mortality since 1950 has been at the global level. For the first time, in 2017, the age group younger than 5 years had fewer deaths than some of other 5-year age groups, like 75–79 years. The decline in the numbers of under-5 deaths might, however, slow down in the coming years. The global number of births per year has remained consistently around 135–140 million births since 1990, but a growing proportion of these births are occurring in low-income countries in sub-Saharan Africa that have the highest under-5 death rates.[31] This shift creates a demographic challenge that might require increased funding efforts for effective child health programmes to sustain progress. At the very least, the shift of the global birth cohort toward more disadvantaged settings warrants careful monitoring if the ambitious goals of the SDGs are to be achieved. The use of internally consistent populations, fertility, birth, and death numbers in the current GBD iteration, GBD 2017, has also resulted in a revision of the total number of global under-5 deaths. GBD 2016 noted that, in 2016, the number of under-5 deaths had dropped below 5 million for the first time. The revised estimates in GBD 2017 indicate that this milestone has not been yet met, as the number of under-5 deaths in 2017 is now estimated to be at 5·4 million (95% UI 5·2–5·6).

By contrast with under-5 deaths, the number of deaths occurring globally at ages older than 65 years has been steadily increasing and has more than tripled since 1950. The increase in the numbers of deaths in the setting of declining or stagnant death rates is due to a shift in the mean age of the world's population and an increase in the average age group of death from 20–24 years in 1950 to 65–69 years in 2017. As of 2008, more than 50% of deaths have occurred among individuals older than 65 years. Monitoring age-sex-specific mortality rates in these older age groups will be increasingly important to evaluate progress in improving health. However, measurement of death rates in these age groups has two fundamental challenges. First, in locations with working VR systems, both the numerator and the denominator are affected by age misreporting; the GBD analysis of population detected considerable evidence of age misreporting at the population level,[31] and it is likely that this is also true for death registration. Second, in settings without death registration, survey data on sibling histories do not provide information on death rates at these older ages. Household recall of deaths in surveys and censuses is uncertain, since telescoping or incomplete recall can lead to biases in either direction. As the world continues to age, more emphasis will be needed on improving the assessment and recording of age in both death registration and census or registry counts.

For the first time, the GBD assessment of age-specific mortality and life expectancy is based on the GBD population estimates, not annual interpolations of the UNPOP estimates. The shift to the GBD population estimates has had an important effect on locations with VR data and where the age-specific assessments of population by the GBD differ from those of UNPOP.[31] Differences in age-specific estimates are largest in some older age groups in some countries. For example, in Costa Rica, which has complete death registration, the life expectancy at age 15 years in the year 2015 changed from 66·92 years in GBD 2016 to 65·77 years (95% UI 65·6–65·9) in GBD 2017 due to the change in population denominators. Populations have also changed considerably in some smaller countries such as Bermuda. In countries without VR data, changes in the population denominators have had a much smaller effect since the mortality rates derived from summary birth histories, complete birth histories, sibling histories, and household deaths are not affected by population numbers. In these settings, changes in the population age-structure have resulted in changes in the estimated number of deaths but not the death rates.

Our assessment of the role of fatal discontinuities and their effect on age-specific mortality highlights the enormous impact that conflicts, natural disasters, famines, and some epidemics can have on the number of deaths from year to year, on top of longer-term trends. The most notable fatal discontinuity in the past 68 years was the Great Leap Forward in China, which had a demonstrable impact on global deaths between 1959 and 1961. Reconstructing the impact of the Great Leap Forward on death rates is particularly challenging. Many studies have been published on the effects of the Great Leap Forward, with estimates ranging from 2 million to 55 million deaths.[48,49] Other fatal discontinuities, such as the Rwanda genocide and the conflict in Syria, have also had large effects on mortality in specific locations since 1990.

Sex differences in life expectancy have a characteristic pattern with level of development: differences tend to increase across the first four quintiles of SDI such that women's advantage increases steadily. For the highest quintile of SDI, particularly in the past 20 years, the women's life expectancy advantage is shrinking. Our analysis also shows that, above and beyond the level expected on the basis of SDI, in the central Europe, eastern Europe, and central Asia super-region, women's life expectancies are much higher than those of men. These spatial and temporal patterns in the sex gap in life expectancies highlight the complex set of social, cultural, and economic factors that explain life expectancy differences. Purely biological differences in survival are likely to be small, less than 1–2 years of life expectancy;[50] differences of this magnitude are seen in the subnational locations with the highest levels of SDI in the UK, the USA, and Japan. In some countries, particularly those with low SDI, the differences are smaller than this biological component or there might even be higher life expectancies for men than women. In these situations, disadvantages in the status of women, access to health care, and other factors might contribute to explain the disadvantage for women; maternal mortality in these settings is also an important contributor. In many locations, however, the male disadvantage is much larger than what it would be based purely on the biological difference, and over the past seven decades, the gap between female and male life expectancy has remained surprisingly constant at the global level, despite massive increases in the average life expectancy of both sexes. Understanding how much of this male disadvantage is due to known risk factors, including risk-taking behaviour associated with masculine social roles and occupational risks, how much is differential use of health care or low adherence to treatment, and how much is other determinants will be an important step to quantifying how to reduce this sex difference in life expectancies.

Improving estimation

In GBD 2017, we extended the analysis of age-specific mortality rates back to 1950, adding two decades of assessment. In some lower-SDI regions, particularly those in west, east, and central sub-Saharan Africa, the data for mortality measurement are sparser for these earlier decades than after 1970. Beginning in the 1970s, the World Fertility Survey started collecting complete birth histories, followed by the Demographic and Health Surveys and in some countries the Multiple Indicator Cluster Surveys. Before 1970, evidence from these regions on levels of child mortality came exclusively from summary birth histories collected in censuses. Information on levels of adult mortality in these regions in the 1950s and 1960s is extremely limited, coming from a few surveys or censuses with household death recall. Estimates of adult mortality in this time period are highly dependent on the covariates used in the first-stage model of the ST-GPR—namely, LDI per capita, educational attainment, total fertility rate, and under-5 death rate. Given the more limited empirical basis for estimation in this period, model specification matters; models that include the under-5 death rate, for example, generally lead to higher estimates in this period than those without the under-5 death rate. In-sample fits with and without the under-5 death rate were quite similar, suggesting that, in future iterations of the GBD, we should consider using an ensemble of the models with fits similar to the available data.

Our model for under-5 mortality includes bias corrections for certain data sources, during which we adjust non-reference sources to the level of designated references sources using a mixed effects regression model. This approach has not been used for the analysis of adult mortality largely because there are fewer overlapping data sources in these age groups. In future work, we will explore whether such an approach should be used for settings with VR and sibling history data.

Following standard demographic approaches, we use death distribution methods to assess the completeness of VR data. We use variants of the three standard death distribution methods, synthetic extinct generations, generalised growth balance, and the hybrid of the two, that were developed and validated using simulation data and data in settings where registration is known to be complete.[33] Although we use optimised versions of these methods, the results of these methods are accompanied by large uncertainty intervals, as shown in studies using simulated data.[33] Moreover, in GBD 2017, the entire time series of results of the death distribution methods is evaluated in a coherent fashion to generate a time series of completeness. In the era of ensemble modelling and machine learning, it might be time to revisit death distribution methods in detail, looking to see if better predictions of death registration completeness can be developed and validated in simulation environments. Analysing all the different age periods of death reporting, called in this literature “age trims”,[33] in a time series manner could provide alternative ways to estimate completeness over time. Even the optimised death distribution methods have not been formulated as statistical models; there are likely to be opportunities to develop Bayesian versions of these models that could enhance performance. Given the importance of these methods for using incomplete VR in demographic analyses, more research on the death distribution methods is warranted.

The development of GBD population estimates[31] also led to a complete overhaul of the empirical life table database used for the GBD model life table system. This database is used to identify the reference standard for the probability of death at each age. For this cycle, we defined objective criteria to assign life tables based on observed deaths (corrected for under-reporting as required) and estimated populations into three groups: high-quality life tables used in the universal database, lower-quality life tables used for only the locations from which that life table was measured, and life tables that were rejected as too low quality. To deal with small number issues, we also considered life tables computed on 3-year, 5-year, and 7-year moving averages of observed death rates. Of 42 138 life tables evaluated, 25·8% were in the high-quality category, 57·5% were in the lower-quality category, and 16·7% were rejected. Because of the large number of candidate life tables, we developed objective criteria that could be applied in an automated fashion based on the variance of the slope of the log death rate versus age curve, mortality declines over the age of 65 years, crossovers in the probability of death between 1 and 5 years (4q1) and between 0 and 1 year (1q0), and large swings in death rates in adjacent age groups. In future work, these criteria could be enhanced by the addition of other screening criteria, particularly at older ages where death rates approach very high levels above the age of 85 years. This more formalised approach to the life table database is necessary because, with each iteration of estimation, the population denominators can change, and thus the shape of the life tables can change. Application of this approach means that we have a much richer database of high-quality life tables than is reflected in the older demographic model life table systems; Ansley Coale and Paul Demeny (1966) used only 192 life tables, whereas the UN Model Life Table System (1955) used only 158 life tables.[51,52] Our larger database of life tables captures many more nuanced patterns that relate to the preponderance of different causes of death in different locations such as infectious diseases, injuries, and some non-communicable causes.

We estimate uncertainty in death rates, and this uncertainty currently reflects sampling error, non-sampling error, and estimation error for the under-5 death rate, the probability of death between 15 and 60 years, and the model life table system, along with uncertainty due to HIV in countries with epidemics with a peak prevalence greater than 0·5%. GBD population estimates used as the denominators for calculating death rates have 95% UIs. However, our uncertainty intervals in this analysis do not incorporate uncertainty in population estimates. Incorporating uncertainty into the population denominator in each step of the GBD mortality analysis would not be trivial. Given the multiple analytical steps that go into our mortality estimation process, there are several challenges. We do not have the computational resources to repeat the entire GBD estimation process multiple times, sampling from the distribution of population by age and sex. Further research is needed to find efficient methods for including the population uncertainty in the final results. Another existing issue is the uncertainty in spatial aggregates such as regional, super-region, or global mortality indicators. Currently, we assume that uncertainty in estimates in different locations is uncorrelated. But this is likely to be an oversimplification because model specification of the first stage in ST-GPR for the under-5 death rate and 45q15 are likely correlated over space. By underestimating this correlation, we are likely to be underestimating the UI for regional, super-region, and global values of life expectancy or other life table indicators. To date, we have not identified any principled basis for estimating the spatial correlation of UIs. To some extent, if we adopted an ensemble modelling approach in the future for the first stage of the ST-GPR, we would automatically incorporate the spatial correlation due to specification uncertainty, which might be another reason for future iterations to explore that strategy.

As part of each annual GBD update, we have re-estimated the entire time series of age-specific mortality by location covered by the study to ensure that we produce an internally consistent time series using the latest methods. Changes from cycle to cycle can be due to the use of new mortality data, changes in population, changes in covariate values, changes in which covariates are used, and changes in model specification including hyperparameter values. It would be useful in future iterations of the GBD to provide some decomposition of changes in the final results due to each of these factors for each location and year. Such a full decomposition of change would be highly computationally intensive and is beyond our current capabilities. Future work will explore ways in which this more formal analysis of change can be efficiently implemented.

Comparison to UNPOP

The main alternative provider of mortality estimates is UNPOP. Scatterplots of estimates of life expectancy at birth from UNPOP compared to GBD in 1950, 1960, 1970, 1980, 1990, 2000, 2010, and 2017, for both sexes combined, are shown in appendix 2. Life expectancy from UNPOP is reported for 5-year intervals, so these figures are based on linear interpolation—eg, 1960 is the interpolation of the values for 1955–1960 with the values for 1960–1965. The concordance correlation coefficient between the two sets of estimates ranged from 0·86 in the year 1950 to 0·97 in the year 2003. The concordance correlation coefficient in 2017 was 0·93. While these concordance coefficients appear to be high, there are considerable differences in many locations. Differences in life expectancy were larger in the earlier periods, and concordance gets higher in more recent time periods, most likely as a result of increased data availability over time. However, there are some substantial differences between the UNPOP and GBD estimates even for the summary measure of life expectancy at birth. These differences are not restricted to sub-Saharan Africa, where data are more scarce, but are also noticeable in other regions, including Latin America and the Caribbean. It is challenging to disentangle the main drivers of the differences, because the methods used by the UNPOP to estimate mortality for each location are not sufficiently documented. For some locations, the UNPOP estimates of life expectancy are based on levels of child mortality and selection of a Coale and Demeny Model Life Table or UN Model Life Table. In west Africa, the differences stem in part from our analysis using sibling history data as one of the key inputs along with Demographic Surveillance Site data where available. In other regions such as Central America, differences seem to stem from very different assessments of the completeness of VR, although the method used by the UNPOP to come to these judgments is not documented. Given the widespread use of life expectancy as both a summary measure of mortality and as a general measure of the progress of nations, such large differences in life expectancy between UNPOP and GBD estimates warrant broader scientific debate.

Limitations

This study has several limitations. First, we use sibling history data corrected for survivor bias and recall bias.[40,53] Although the validity of sibling histories has been challenged, empirical studies to date have not provided a clear answer on a consistent direction of the bias.[40,54] We believe it is appropriate to use the sibling history data that are available, but these data suggest much lower levels of adult mortality in some parts of west Africa than would be predicted from child mortality alone. Second, estimates of the completeness of VR are based on the application of death distribution methods, which are highly uncertain as shown in studies using simulated data.[33] Third, in some locations where there is evidence of substantial age misreporting at older ages, the GBD estimates of the age structure of the population in the terminal age group, which might be as young as 65 years or older, use estimated death rates as an input. In locations with VR data, this creates a circularity where population distribution within the terminal age group depends on death rates in those age groups that depend on population denominators. We deal with this circularity by looping through the entire population estimation process several times to reach a stable estimate of population and death rates. Nevertheless, this interdependence means that estimates of death rates with partial or complete VR in locations with substantial age misreporting might be biased. Fourth, our estimates of death rates at ages 5–9 and 10–14 years in settings without VR data depend on the selection of a model life table reference using the under-5 death rates, the adult mortality rate, and the database of empirical mortality patterns in the life table database. We have not used direct measurement of adolescent mortality calculated from birth histories because we have not yet been able to evaluate the impact of recall bias on these estimates. For future GBD iterations, we will continue to explore the incorporation of this information and DSS data on death rates in 5–9 and 10–14 year olds. Fifth, we continue to use modelled HIV/AIDS death rates based on the analysis of HIV/AIDS prevalence data using Spectrum to revise adult mortality estimates in locations without VR data and with peak HIV/AIDS prevalence greater than 0·5%. However, the estimation of death rates from HIV/AIDS on the basis of prevalence data and the scale-up of anti-retroviral therapy are dependent on many assumptions and might still tend to overestimate mortality in these locations. Sixth, we are not able to capture all fatal discontinuities, particularly the smaller ones. We will continue to explore data on fatal discontinuities and incorporate them for further iterations of the GBD. Moreover, the magnitude of fatal discontinuities in many locations is fundamentally based on media reports of events on a particular day in a particular place. These media reports, even when highly detailed, might not be accurate. Seventh, we have not explored multiple data density scores for the selection of hyperparameters in the ST-GPR, but hope to explore this further in future GBD iterations.

Conclusion

This analysis of age-sex-specific mortality shows that, against a general background of consistent declines in death rates for most age groups over the past 68 years, there are remarkably complex patterns across countries. Levels and trends are particularly heterogeneous in younger adults, which suggests that drivers of health outcomes are more varied and complex in these age groups. Given that the SDGs have been framed to be ambitious and refer to health across the lifespan, careful monitoring of age-sex-specific levels of mortality will remain crucial. The GBD provides the only annually revised, GATHER-compliant set of estimates for the assessment of performance against local, national, and global goals. As several reversals in formerly declining mortality rates demonstrate, continued reductions in age-specific mortality should not be taken for granted. Monitoring trends in the future is critical as progress in many locations and certain age groups has stagnated.

GBD 2017 Mortality Collaborators

Daniel Dicker, Grant Nguyen, Degu Abate, Kalkidan Hassen Abate, Solomon M Abay, Cristiana Abbafati, Nooshin Abbasi, Hedayat Abbastabar, Foad Abd-Allah, Jemal Abdela, Ahmed Abdelalim, Omar Abdel-Rahman, Alireza Abdi, Ibrahim Abdollahpour, Rizwan Suliankatchi Abdulkader, Ahmed Abdulahi Abdurahman, Haftom Temesgen Abebe, Molla Abebe, Zegeye Abebe, Teshome Abuka Abebo, Victor Aboyans, Haftom Niguse Abraha, Aklilu Roba Abrham, Laith Jamal Abu-Raddad, Niveen ME Abu-Rmeileh, Manfred Mario Kokou Accrombessi, Pawan Acharya, Oladimeji M Adebayo, Isaac Akinkunmi Adedeji, Rufus Adesoji Adedoyin, Victor Adekanmbi, Olatunji O Adetokunboh, Beyene Meressa Adhena, Tara Ballav Adhikari, Mina G Adib, Arsène Kouablan Adou, Jose C Adsuar, Mohsen Afarideh, Ashkan Afshin, Gina Agarwal, Rakesh Aggarwal, Sargis Aghasi Aghayan, Sutapa Agrawal, Anurag Agrawal, Mehdi Ahmadi, Alireza Ahmadi, Hamid Ahmadieh, Mohamed Lemine Cheikh brahim Ahmed, Sayem Ahmed, Muktar Beshir Ahmed, Amani Nidhal Aichour, Ibtihel Aichour, Miloud Taki Eddine Aichour, Ali S Akanda, Mohammad Esmaeil Akbari, Mohammed Akibu, Rufus Olusola Akinyemi, Tomi Akinyemiju, Nadia Akseer, Fares Alahdab, Ziyad Al-Aly, Khurshid Alam, Animut Alebel, Alicia V Aleman, Kefyalew Addis Alene, Ayman Al-Eyadhy, Raghib Ali, Mehran Alijanzadeh, Reza Alizadeh-Navaei, Syed Mohamed Aljunid, Ala'a Alkerwi, François Alla, Peter Allebeck, Christine A Allen, Jordi Alonso, Rajaa M Al-Raddadi, Ubai Alsharif, Khalid Altirkawi, Nelson Alvis-Guzman, Azmeraw T Amare, Erfan Amini, Walid Ammar, Yaw Ampem Amoako, Nahla Hamed Anber, Catalina Liliana Andrei, Sofia Androudi, Megbaru Debalkie Animut, Mina Anjomshoa, Degefaye Zelalem Anlay, Hossein Ansari, Ansariadi Ansariadi, Mustafa Geleto Ansha, Carl Abelardo T Antonio, Seth Christopher Yaw Appiah, Olatunde Aremu, Habtamu Abera Areri, Johan Ärnlöv, Megha Arora, Al Artaman, Krishna K Aryal, Mohsen Asadi-Lari, Hamid Asayesh, Ephrem Tsegay Asfaw, Solomon Weldegebreal Asgedom, Reza Assadi, Zerihun Ataro, Tesfay Mehari Mehari Atey, Seyyed Shamsadin Athari, Suleman Atique, Sachin R Atre, Madhu Sudhan Atteraya, Engi F Attia, Marcel Ausloos, Leticia Avila-Burgos, Euripide F G A Avokpaho, Ashish Awasthi, Baffour Awuah, Beatriz Paulina Ayala Quintanilla, Henok Tadesse Ayele, Yohanes Ayele, Rakesh Ayer, Tambe B Ayuk, Peter S Azzopardi, Natasha Azzopardi-Muscat, Hamid Badali, Alaa Badawi, Kalpana Balakrishnan, Ayele Geleto Bali, Maciej Banach, Amrit Banstola, Aleksandra Barac, Miguel A Barboza, Simon Barquera, Lope H Barrero, Huda Basaleem, Quique Bassat, Arindam Basu, Sanjay Basu, Bernhard T Baune, Shahrzad Bazargan-Hejazi, Neeraj Bedi, Ettore Beghi, Masoud Behzadifar, Meysam Behzadifar, Yannick Béjot, Bayu Begashaw Bekele, Abate Bekele Belachew, Aregawi Gebreyesus Belay, Ezra Belay, Saba Abraham Belay, Yihalem Abebe Belay, Michelle L Bell, Aminu K Bello, Derrick A Bennett, Isabela M Bensenor, Adugnaw Berhane, Adam E Berman, Eduardo Bernabe, Robert S Bernstein, Gregory J Bertolacci, Mircea Beuran, Tina Beyranvand, Neeraj Bhala, Eesh Bhatia, Samir Bhatt, Suraj Bhattarai, Soumyadeeep Bhaumik, Zulfiqar A Bhutta, Belete Biadgo, Ali Bijani, Boris Bikbov, Nigus Bililign, Muhammad Shahdaat Bin Sayeed, Sait Mentes Birlik, Charles Birungi, Donal Bisanzio, Tuhin Biswas, Tone Bjørge, Archie Bleyer, Berrak Bora Basara, Dipan Bose, Cristina Bosetti, Soufiane Boufous, Rupert Bourne, Oliver J Brady, Nicola Luigi Bragazzi, Luisa C Brant, Alexandra Brazinova, Nicholas J K Breitborde, Hermann Brenner, Gabrielle Britton, Traolach Brugha, Kristin E Burke, Reinhard Busse, Zahid A Butt, Lucero Cahuana-Hurtado, Charlton S K H Callender, Ismael R Campos-Nonato, Julio Cesar Campuzano Rincon, Jorge Cano, Mate Car, Rosario Cárdenas, Giulia Carreras, Juan J Carrero, Austin Carter, Félix Carvalho, Carlos A Castañeda-Orjuela, Jacqueline Castillo Rivas, Franz Castro, Ferrán Catalá-López, Alanur Çavlin, Ester Cerin, Yazan Chaiah, Ana Paula Champs, Hsing-Yi Chang, Jung-Chen Chang, Aparajita Chattopadhyay, Pankaj Chaturvedi, Wanqing Chen, Peggy Pei-Chia Chiang, Odgerel Chimed-Ochir, Ken Lee Chin, Vesper Hichilombwe Chisumpa, Abdulaal Chitheer, Jee-Young J Choi, Hanne Christensen, Devasahayam J Christopher, Sheng-Chia Chung, Flavia M Cicuttini, Liliana G Ciobanu, Massimo Cirillo, Rafael M Claro, Aaron J Cohen, Daniel Collado-Mateo, Maria-Magdalena Constantin, Sara Conti, Cyrus Cooper, Leslie Trumbull Cooper, Paolo Angelo Cortesi, Monica Cortinovis, Ewerton Cousin, Michael H Criqui, Elizabeth A Cromwell, Christopher Stephen Crowe, John A Crump, Alexandra Cucu, Matthew Cunningham, Alemneh Kabeta Daba, Berihun Assefa Dachew, Abel Fekadu Dadi, Lalit Dandona, Rakhi Dandona, Anh Kim Dang, Paul I Dargan, Ahmad Daryani, Siddharth K Das, Rajat Das Gupta, José das Neves, Tamirat Tesfaye Dasa, Aditya Prasad Dash, Nicole Davis Weaver, Dragos Virgil Davitoiu, Kairat Davletov, Anand Dayama, Barbora de Courten, Fernando Pio De la Hoz, Diego De leo, Jan-Walter De Neve, Meaza Girma Degefa, Louisa Degenhardt, Tizta T Degfie, Selina Deiparine, Robert P Dellavalle, Gebre Teklemariam Demoz, Balem Betsu Demtsu, Edgar Denova-Gutiérrez, Kebede Deribe, Nikolaos Dervenis, Don C Des Jarlais, Getenet Ayalew Dessie, Subhojit Dey, Samath Dhamminda Dharmaratne, Meghnath Dhimal, Eric L Ding, Shirin Djalalinia, David Teye Doku, Kate A Dolan, Christl A Donnelly, E Ray Dorsey, Dirk Douwes-Schultz, Kerrie E Doyle, Thomas M Drake, Tim Robert Driscoll, Manisha Dubey, Eleonora Dubljanin, Eyasu Ejeta Duken, Bruce B Duncan, Andre R Duraes, Hedyeh Ebrahimi, Soheil Ebrahimpour, Dumessa Edessa, David Edvardsson, Anne Elise Eggen, Charbel El Bcheraoui, Maysaa El Sayed Zaki, Mohammed Elfaramawi, Ziad El-Khatib, Christian Lycke Ellingsen, Iqbal R F Elyazar, Ahmadali Enayati, Aman Yesuf Yesuf Endries, Benjamin Er, Sergey Petrovich Ermakov, Babak Eshrati, Sharareh Eskandarieh, Reza Esmaeili, Alireza Esteghamati, Sadaf Esteghamati, Mahdi Fakhar, Hamed Fakhim, Tamer Farag, Mahbobeh Faramarzi, Mohammad Fareed, Farzaneh Farhadi, Talha A Farid, Carla Sofia e Sá Farinha, Andrea Farioli, Andre Faro, Maryam S Farvid, Farshad Farzadfar, Mohammad Hosein Farzaei, Mir Sohail Fazeli, Valery L Feigin, Andrea B Feigl, Fariba Feizy, Netsanet Fentahun, Seyed-Mohammad Fereshtehnejad, Eduarda Fernandes, Joao C Fernandes, Garumma Tolu Feyissa, Daniel Obadare Fijabi, Irina Filip, Samuel Finegold, Florian Fischer, Luisa Sorio Flor, Nataliya A Foigt, John A Ford, Kyle J Foreman, Carla Fornari, Tahvi D Frank, Richard Charles Franklin, Takeshi Fukumoto, John E Fuller, Nancy Fullman, Thomas Fürst, João M Furtado, Neal D Futran, Adriana Galan, Silvano Gallus, Ketevan Gambashidze, Amiran Gamkrelidze, Fortune Gbetoho Gankpe, Alberto L Garcia-Basteiro, Miguel A Garcia-Gordillo, Teshome Gebre, Abadi Kahsu Gebre, Gebremedhin Berhe Gebregergs, Tsegaye Tewelde Gebrehiwot, Amanuel Tesfay Gebremedhin, Tilayie Feto Gelano, Yalemzewod Assefa Gelaw, Johanna M Geleijnse, Ricard Genova-Maleras, Bradford D Gessner, Sefonias Getachew, Peter W Gething, Kebede Embaye Gezae, Mohammad Rasoul Ghadami, Reza Ghadimi, Khalil Ghasemi Falavarjani, Maryam Ghasemi-Kasman, Hesam Ghiasvand, Mamata Ghimire, Aloke Gopal Ghoshal, Paramjit Singh Gill, Tiffany K Gill, Richard F Gillum, Giorgia Giussani, Shifalika Goenka, Srinivas Goli, Ricardo Santiago Gomez, Mari Carmen Gomez-Cabrera, Hector Gómez-Dantés, Philimon N Gona, Amador Goodridge, Sameer Vali Gopalani, Atsushi Goto, Alessandra C Goulart, Bárbara Niegia Garcia Goulart, Ayman Grada, Giuseppe Grosso, Harish Chander Gugnani, Andre Luiz Sena Guimaraes, Yuming Guo, Prakash C Gupta, Rahul Gupta, Rajeev Gupta, Tanush Gupta, Bishal Gyawali, Juanita A Haagsma, Vladimir Hachinski, Nima Hafezi-Nejad, Tekleberhan B Hagos, Tewodros Tesfa Hailegiyorgis, Gessessew Bugssa Hailu, Arya Haj-Mirzaian, Arvin Haj-Mirzaian, Randah R Hamadeh, Samer Hamidi, Alexis J Handal, Graeme J Hankey, Hilda L Harb, Sivadasanpillai Harikrishnan, Hamidreza Haririan, Josep Maria Haro, Mehedi Hasan, Hadi Hassankhani, Hamid Yimam Hassen, Rasmus Havmoeller, Roderick J Hay, Simon I Hay, Yihua He, Akbar Hedayatizadeh-Omran, Mohamed I Hegazy, Behzad Heibati, Mohsen Heidari, Delia Hendrie, Andualem Henok, Nathaniel J Henry, Ileana Heredia-Pi, Claudiu Herteliu, Fatemeh Heydarpour, Pouria Heydarpour, Sousan Heydarpour, Desalegn Tsegaw Hibstu, Hans W Hoek, Michael K Hole, Enayatollah Homaie Rad, Praveen Hoogar, Masako Horino, H Dean Hosgood, Seyed Mostafa Hosseini, Mehdi Hosseinzadeh, Sorin Hostiuc, Mihaela Hostiuc, Peter J Hotez, Damian G Hoy, Mohamed Hsairi, Aung Soe Htet, Guoqing Hu, John J Huang, Abdullatif Husseini, Mohammedaman Mama Hussen, Susan Hutfless, Kim Moesgaard Iburg, Ehimario U Igumbor, Chad Thomas Ikeda, Olayinka Stephen Ilesanmi, Usman Iqbal, Seyed Sina Naghibi Irvani, Oluwaseyi Oluwakemi Isehunwa, Sheikh Mohammed Shariful Islam, Farhad Islami, Leila Jahangiry, Nader Jahanmehr, Rajesh Jain, Sudhir Kumar Jain, Mihajlo Jakovljevic, Spencer L James, Mehdi Javanbakht, Sudha Jayaraman, Achala Upendra Jayatilleke, Sun Ha Jee, Panniyammakal Jeemon, Ravi Prakash Jha, Vivekanand Jha, John S Ji, Sarah Charlotte Johnson, Jost B Jonas, Ankur Joshi, Jacek Jerzy Jozwiak, Suresh Banayya Jungari, Mikk Jürisson, Madhanraj K, Zubair Kabir, Rajendra Kadel, Amaha Kahsay, Molla Kahssay, Rizwan Kalani, Umesh Kapil, Manoochehr Karami, Behzad Karami Matin, André Karch, Corine Karema, Narges Karimi, Seyed M Karimi, Hamidreza Karimi-Sari, Amir Kasaeian, Getachew Mullu Kassa, Tesfaye Dessale Kassa, Zemenu Yohannes Kassa, Nicholas J Kassebaum, Marzieh Katibeh, Srinivasa Vittal Katikireddi, Anil Kaul, Norito Kawakami, Hossein Kazemeini, Zhila Kazemi, Ali Kazemi Karyani, Prakash K C, Seifu Kebede, Peter Njenga Keiyoro, Grant Rodgers Kemp, Andre Pascal Kengne, Andre Keren, Maia Kereselidze, Yousef Saleh Khader, Morteza Abdullatif Khafaie, Alireza Khajavi, Nauman Khalid, Ibrahim A Khalil, Ejaz Ahmad Khan, Gulfaraz Khan, Muhammad Shahzeb Khan, Muhammad Ali Khan, Young-Ho Khang, Tripti Khanna, Mona M Khater, Alireza Khatony, Habibolah Khazaie, Abdullah T Khoja, Ardeshir Khosravi, Mohammad Hossein Khosravi, Jagdish Khubchandani, Aliasghar A Kiadaliri, Getiye D Dejenu Kibret, Cho-il Kim, Daniel Kim, Jun Y Kim, Young-Eun Kim, Ruth W Kimokoti, Yohannes Kinfu, Sanjay Kinra, Adnan Kisa, Katarzyna Kissimova-Skarbek, Niranjan Kissoon, Mika Kivimäki, Marcus E Kleber, Luke D Knibbs, Ann Kristin Skrindo Knudsen, Sonali Kochhar, Yoshihiro Kokubo, Tufa Kolola, Jacek A Kopec, Margaret N Kosek, Soewarta Kosen, Parvaiz A Koul, Ai Koyanagi, Michael A Kravchenko, Kewal Krishan, Sanjay Krishnaswami, Barthelemy Kuate Defo, Burcu Kucuk Bicer, Andreas A Kudom, Ernst J Kuipers, Xie Rachel Kulikoff, G Anil Kumar, Manasi Kumar, Pushpendra Kumar, Fekede Asefa Kumsa, Michael J Kutz, Sheetal D Lad, Alessandra Lafranconi, Dharmesh Kumar Lal, Ratilal Lalloo, Hilton Lam, Faris Hasan Lami, Qing Lan, Sinéad M Langan, Van C Lansingh, Sonia Lansky, Heidi Jane Larson, Dennis Odai Laryea, Zohra S Lassi, Arman Latifi, Pablo M Lavados, Avula Laxmaiah, Jeffrey V Lazarus, Georgy Lebedev, Paul H Lee, James Leigh, Cheru Tesema Leshargie, Samson Leta, Miriam Levi, Shanshan Li, Yichong Li, Xiaohong Li, Juan Liang, Xiaofeng Liang, Misgan Legesse Liben, Lee-Ling Lim, Stephen S Lim, Miteku Andualem Limenih, Shai Linn, Shiwei Liu, Yang Liu, Rakesh Lodha, Giancarlo Logroscino, Chris Lonsdale, Scott A Lorch, Stefan Lorkowski, Paulo A Lotufo, Rafael Lozano, Tim C D Lucas, Raimundas Lunevicius, Ronan A Lyons, Stefan Ma, Crispin Mabika, Erlyn Rachelle King Macarayan, Mark T Mackay, Emilie R Maddison, Ralph Maddison, Fabiana Madotto, Hassan Magdy Abd El Razek, Muhammed Magdy Abd El Razek, Dhaval P Maghavani, Marek Majdan, Reza Majdzadeh, Azeem Majeed, Reza Malekzadeh, Manzoor Ahmad Malik, Deborah Carvalho Malta, Abdullah A Mamun, Wondimu Ayele Manamo, Ana-Laura Manda, Mohammad Ali Mansournia, Lorenzo Giovanni Mantovani, Chabila Christopher Mapoma, Dadi Marami, Joemer C Maravilla, Wagner Marcenes, Shakhnazarova Marina, Jose Martinez-Raga, Sheila C O Martins, Francisco Rogerlândio Martins-Melo, Winfried März, Melvin B Marzan, Tivani Phosa Mashamba-Thompson, Felix Masiye, Benjamin Ballard Massenburg, Pallab K Maulik, Mohsen Mazidi, John J McGrath, Martin McKee, Suresh Mehata, Sanjay Madhav Mehendale, Man Mohan Mehndiratta, Ravi Mehrotra, Kala M Mehta, Varshil Mehta, Tesfa Mekonen, Tefera Chane Mekonnen, Hagazi Gebre Meles, Kidanu Gebremariam Meles, Addisu Melese, Mulugeta Melku, Peter T N Memiah, Ziad A Memish, Walter Mendoza, Desalegn Tadese Mengistu, Getnet Mengistu, George A Mensah, Seid Tiku Mereta, Atte Meretoja, Tuomo J Meretoja, Tomislav Mestrovic, Haftay Berhane Mezgebe, Yode Miangotar, Bartosz Miazgowski, Tomasz Miazgowski, Ted R Miller, G K Mini, Andreea Mirica, Erkin M Mirrakhimov, Awoke Temesgen Misganaw, Babak Moazen, Nurilign Abebe Moges, Karzan Abdulmuhsin Mohammad, Moslem Mohammadi, Noushin Mohammadifard, Maryam Mohammadi-Khanaposhtani, Mousa Mohammadnia-Afrouzi, Shafiu Mohammed, Mohammed A Mohammed, Viswanathan Mohan, Ali H Mokdad, Mariam Molokhia, Lorenzo Monasta, Ghobad Moradi, Mahmoudreza Moradi, Maziar Moradi-Lakeh, Mehdi Moradinazar, Paula Moraga, Lidia Morawska, Ilais Moreno Velásquez, Joana Morgado-da-Costa, Shane Douglas Morrison, Abbas Mosapour, Marilita M Moschos, Seyyed Meysam Mousavi, Achenef Asmamaw Muche, Kindie Fentahun Muchie, Ulrich Otto Mueller, Satinath Mukhopadhyay, Erin C Mullany, Kate Muller, Manoj Murhekar, Tasha B Murphy, G V S Murthy, Srinivas Murthy, Jonah Musa, Kamarul Imran Musa, Ghulam Mustafa, Saravanan Muthupandian, Jean B Nachega, Gabriele Nagel, Mohsen Naghavi, Aliya Naheed, Azin Nahvijou, Gurudatta Naik, Sanjeev Nair, Farid Najafi, Vinay Nangia, Jobert Richie Nansseu, Bruno Ramos Nascimento, Haseeb Nawaz, Busisiwe P Ncama, Nahid Neamati, Ionut Negoi, Ruxandra Irina Negoi, Subas Neupane, Charles Richard James Newton, Frida N Ngalesoni, Josephine W Ngunjiri, Ha Thu Nguyen, Huong Thanh Nguyen, Long Hoang Nguyen, Michele Nguyen, Trang Huyen Nguyen, Dina Nur Anggraini Ningrum, Yirga Legesse Nirayo, Muhammad Imran Nisar, Molly R Nixon, Nomonde Nolutshungu, Shuhei Nomura, Ole F Norheim, Mehdi Noroozi, Bo Norrving, Jean Jacques Noubiap, Hamid Reza Nouri, Malihe Nourollahpour Shiadeh, Mohammad Reza Nowroozi, Elaine O Nsoesie, Peter S Nyasulu, Richard Ofori-Asenso, Okechukwu Samuel Ogah, Felix Akpojene Ogbo, In-Hwan Oh, Anselm Okoro, Olanrewaju Oladimeji, Andrew T Olagunju, Tinuke O Olagunju, Pedro R Olivares, Bolajoko Olubukunola Olusanya, Jacob Olusegun Olusanya, Sok King Ong, John Nelson Opio, Eyal Oren, Justin R Ortiz, Alberto Ortiz, Erika Ota, Stanislav S Otstavnov, Simon Øverland, Mayowa Ojo Owolabi, Abayomi Samuel Oyekale, Mahesh P A, Rosana Pacella, Smita Pakhale, Abhijit P Pakhare, Adrian Pana, Basant Kumar Panda, Songhomitra Panda-Jonas, Achyut Raj Pandey, Jeyaraj Durai Pandian, Andrea Parisi, Eun-Kee Park, Charles D H Parry, Hadi Parsian, Shanti Patel, Ajay Patle, Scott B Patten, George C Patton, Deepak Paudel, Neil Pearce, Emmanuel K Peprah, Alexandre Pereira, David M Pereira, Krystle M Perez, Norberto Perico, Aslam Pervaiz, Konrad Pesudovs, William A Petri, Max Petzold, Michael R Phillips, David M Pigott, Julian David Pillay, Meghdad Pirsaheb, Farhad Pishgar, Dietrich Plass, Suzanne Polinder, Constance Dimity Pond, Svetlana Popova, Maarten J Postma, Farshad Pourmalek, Akram Pourshams, Hossein Poustchi, Dorairaj Prabhakaran, V Prakash, Swayam Prakash, Narayan Prasad, Mostafa Qorbani, D Alex Quistberg, Amir Radfar, Anwar Rafay, Alireza Rafiei, Fakher Rahim, Kazem Rahimi, Afarin Rahimi-Movaghar, Vafa Rahimi-Movaghar, Mahfuzar Rahman, Mohammad Hifz Ur Rahman, Muhammad Aziz Rahman, Sajjad ur Rahman, Rajesh Kumar Rai, Fatemeh Rajati, Sasa Rajsic, Sree Bhushan Raju, Usha Ram, Chhabi Lal Ranabhat, Prabhat Ranjan, Anna Ranta, Davide Rasella, David Laith Rawaf, Salman Rawaf, Sarah E Ray, Christian Razo-García, Maria Albertina Santiago Rego, Jürgen Rehm, Robert C Reiner, Nickolas Reinig, Cesar Reis, Giuseppe Remuzzi, Andre M N Renzaho, Serge Resnikoff, Satar Rezaei, Shahab Rezaeian, Mohammad Sadegh Rezai, Seyed Mohammad Riahi, Antonio Luiz P Ribeiro, Horacio Riojas, Maria Jesus Rios-Blancas, Kedir Teji Roba, Stephen R Robinson, Leonardo Roever, Luca Ronfani, Gholamreza Roshandel, Denis O Roshchin, Ali Rostami, Dietrich Rothenbacher, Enrico Rubagotti, George Mugambage Ruhago, Soheil Saadat, Yogesh Damodar Sabde, Perminder S Sachdev, Basema Saddik, Ehsan Sadeghi, Sahar Saeedi Moghaddam, Hosein Safari, Yahya Safari, Roya Safari-Faramani, Mahdi Safdarian, Sare Safi, Saeid Safiri, Rajesh Sagar, Amirhossein Sahebkar, Mohammad Ali Sahraian, Haniye Sadat Sajadi, Mohamad Reza Salahshoor, Nasir Salam, Joseph S Salama, Payman Salamati, Raphael de Freitas Saldanha, Yahya Salimi, Hamideh Salimzadeh, Inbal Salz, Evanson Zondani Sambala, Abdallah M Samy, Juan Sanabria, Maria Dolores Sanchez-Niño, Itamar S Santos, João Vasco Santos, Milena M Santric Milicevic, Bruno Piassi Sao Jose, Mayank Sardana, Abdur Razzaque Sarker, Nizal Sarrafzadegan, Benn Sartorius, Shahabeddin Sarvi, Brijesh Sathian, Maheswar Satpathy, Miloje Savic, Arundhati R Sawant, Monika Sawhney, Sonia Saxena, Mehdi Sayyah, Vinod Scaria, Elke Schaeffner, Kathryn Schelonka, Maria Inês Schmidt, Ione J C Schneider, Ben Schöttker, Aletta Elisabeth Schutte, David C Schwebel, Falk Schwendicke, James G Scott, Mario Sekerija, Sadaf G Sepanlou, Edson Serván-Mori, Hosein Shabaninejad, Katya Anne Shackelford, Azadeh Shafieesabet, Amira A Shaheen, Masood Ali Shaikh, Raad A Shakir, Mehran Shams-Beyranvand, MohammadBagher Shamsi, Morteza Shamsizadeh, Heidar Sharafi, Kiomars Sharafi, Mehdi Sharif, Mahdi Sharif-Alhoseini, Meenakshi Sharma, Jayendra Sharma, Rajesh Sharma, Jun She, Aziz Sheikh, Kevin N Sheth, Peilin Shi, Kenji Shibuya, Girma Temam Shifa, Mekonnen Sisay Shiferaw, Mika Shigematsu, Rahman Shiri, Reza Shirkoohi, Ivy Shiue, Farhad Shokraneh, Mark G Shrime, Sharvari Rahul Shukla, Si Si, Soraya Siabani, Tariq J Siddiqi, Inga Dora Sigfusdottir, Rannveig Sigurvinsdottir, Naris Silpakit, Diego Augusto Santos Silva, João Pedro Silva, Dayane Gabriele Alves Silveira, Narayana Sarma Venkata Singam, Jasvinder A Singh, Virendra Singh, Anju Pradhan Sinha, Dhirendra Narain Sinha, Freddy Sitas, Vegard Skirbekk, Karen Sliwa, Adauto Martins Soares Filho, Badr Hasan Sobaih, Soheila Sobhani, Moslem Soofi, Joan B Soriano, Ireneous N Soyiri, Luciano A Sposato, Chandrashekhar T Sreeramareddy, Vinay Srinivasan, Rakesh Kumar Srivastava, Vladimir I Starodubov, Vasiliki Stathopoulou, Nicholas Steel, Dan J Stein, Caitlyn Steiner, Leo G Stewart, Mark A Stokes, Agus Sudaryanto, Mu'awiyyah Babale Sufiyan, Gerhard Sulo, Bruno F Sunguya, Patrick John Sur, Ipsita Sutradhar, Bryan L Sykes, P N Sylaja, Dillon O Sylte, Cassandra E I Szoeke, Rafael Tabarés-Seisdedos, Takahiro Tabuchi, Santosh Kumar Tadakamadla, Ken Takahashi, Nikhil Tandon, Aberash Abay Tassew, Segen Gebremeskel Tassew, Mohammad Tavakkoli, Nuno Taveira, Nega Yimer Tawye, Arash Tehrani-Banihashemi, Tigist Gashaw Tekalign, Merhawi Gebremedhin Tekle, Habtamu Temesgen, Mohamad-Hani Temsah, Omar Temsah, Abdullah Sulieman Terkawi, Manaye Yihune Teshale, Belay Tessema, Mebrahtu Teweldemedhin, Jarnail Singh Thakur, Kavumpurathu Raman Thankappan, Sathish Thirunavukkarasu, Laura Anne Thomas, Nihal Thomas, Amanda G Thrift, Binyam Tilahun, Quyen G To, Ruoyan Tobe-Gai, Marcello Tonelli, Roman Topor-Madry, Fotis Topouzis, Anna E Torre, Miguel Tortajada-Girbés, Marcos Roberto Tovani-Palone, Jeffrey A Towbin, Bach Xuan Tran, Khanh Bao Tran, Suryakant Tripathi, Srikanth Prasad Tripathy, Thomas Clement Truelsen, Nu Thi Truong, Afewerki Gebremeskel Tsadik, Nikolaos Tsilimparis, Lorainne Tudor Car, E Murat Tuzcu, Stefanos Tyrovolas, Kingsley Nnanna Ukwaja, Irfan Ullah, Muhammad Shariq Usman, Olalekan A Uthman, Selen Begüm Uzun, Muthiah Vaduganathan, Afsane Vaezi, Gaurang Vaidya, Pascual R Valdez, Elena Varavikova, Santosh Varughese, Tommi Juhani Vasankari, Ana Maria Nogales Vasconcelos, Narayanaswamy Venketasubramanian, Ramesh Vidavalur, Santos Villafaina, Francesco S Violante, Sergey Konstantinovitch Vladimirov, Vasily Vlassov, Stein Emil Vollset, Theo Vos, Kia Vosoughi, Isidora S Vujcic, Gregory R Wagner, Fasil Wagnew Shiferaw Wagnew, Yasir Waheed, Yanping Wang, Yuan-Pang Wang, Molla Mesele Wassie, Elisabete Weiderpass, Robert G Weintraub, Daniel J Weiss, Jordan Weiss, Fitsum Weldegebreal, Kidu Gidey Weldegwergs, Andrea Werdecker, Ronny Westerman, Harvey A Whiteford, Justyna Widecka, Katarzyna Widecka, Tissa Wijeratne, Andrea Sylvia Winkler, Charles Shey Wiysonge, Charles D A Wolfe, Sintayehu Ambachew Wondemagegn, Shouling Wu, Grant M A Wyper, Gelin Xu, Rajaram Yadav, Bereket Yakob, Tomohide Yamada, Lijing L Yan, Yuichiro Yano, Mehdi Yaseri, Yasin Jemal Yasin, Pengpeng Ye, Jamal A Yearwood, Gökalp Kadri Yentür, Alex Yeshaneh, Ebrahim M Yimer, Paul Yip, Engida Yisma, Naohiro Yonemoto, Seok-Jun Yoon, Hunter W York, Marcel Yotebieng, Mustafa Z Younis, Mahmoud Yousefifard, Chuanhua Yu, Geevar Zachariah, Vesna Zadnik, Shamsa Zafar, Zoubida Zaidi, Sojib Bin Zaman, Mohammad Zamani, Zohreh Zare, Hajo Zeeb, Mulugeta Molla Zeleke, Zerihun Menlkalew Zenebe, Taddese Alemu Zerfu, Kai Zhang, Xueying Zhang, Maigeng Zhou, Jun Zhu, Sanjay Zodpey, Inbar Zucker, Liesl Joanna J Zuhlke, Alan D Lopez, Emmanuela Gakidou, Christopher J L Murray.

Affiliations

Institute for Health Metrics and Evaluation (D Dicker BS, G Nguyen MPH, A Afshin MD, C A Allen BA, M Arora BSA, G J Bertolacci BS, C S Callender BS, A Carter MPH, A J Cohen DSc, E A Cromwell PhD, M Cunningham MSc, Prof L Dandona MD, Prof R Dandona PhD, N Davis Weaver MPH, Prof L Degenhardt PhD, S Deiparine BA, S D Dharmaratne MD, D Douwes-Schultz BSc, C El Bcheraoui PhD, T Farag PhD, Prof V L Feigin PhD, S Finegold BS, K J Foreman PhD, T D Frank BS, J E Fuller MLIS, N Fullman MPH, Prof S I Hay FMedSci, Y He MS, N J Henry BS, C T Ikeda BS, S L James MD, S C Johnson MSc, N J Kassebaum MD, G R Kemp BA, I A Khalil MD, J Y Kim BS, X R Kulikoff BA, M J Kutz BS, Prof H J Larson PhD, Prof S S Lim PhD, Prof R Lozano PhD, E R Maddison BS, F Masiye PhD, A T Misganaw PhD, Prof A H Mokdad PhD, E C Mullany BA, K Muller MPH, Prof M Naghavi MD, M R Nixon PhD, E O Nsoesie PhD, D M Pigott DPhil, S E Ray BA, R C Reiner PhD, N Reinig BS, J S Salama MSc, K Schelonka BA, K A Shackelford BA, N Silpakit BS, V Srinivasan BA, C Steiner MPH, L G Stewart BS, P J Sur MPH, D O Sylte BA, A E Torre BS, Prof S E Vollset DrPH, Prof T Vos PhD, Prof H A Whiteford PhD, J A Yearwood BS, H W York BA, Prof A D Lopez PhD, Prof E Gakidou PhD, Prof C J L Murray DPhil), Department of Bioinformatics and Medical Education (E O Nsoesie PhD), Department of Global Health (S Kochhar MD, J R Ortiz MD), Department of Health Metrics Sciences (A Afshin MD, E A Cromwell PhD, C El Bcheraoui PhD, Prof S I Hay FMedSci, Prof S S Lim PhD, Prof A H Mokdad PhD, A T Misganaw PhD, Prof M Naghavi MD, D M Pigott DPhil, R C Reiner PhD, Prof S E Vollset DrPH, Prof T Vos PhD, M Zhou PhD, Prof J Zhu MD, Prof E Gakidou PhD, Prof C J L Murray DPhil), Department of Neurology (R Kalani MD), Department of Otolaryngology-Head and Neck Surgery (N D Futran MD), Department of Pediatrics (K M Perez MD), Department of Surgery (S D Morrison MD), Division of Plastic Surgery (C S Crowe MD, B B Massenburg MD), Division of Pulmonary, Critical Care and Sleep Medicine (E F Attia MD), School of Social Work (T B Murphy PhD), University of Washington, Seattle, WA, USA (Prof E Oren PhD); Department of Medical Laboratory Science (Z Ataro MSc, D Marami MSc, F Weldegebreal MPH), Department of Pediatrics (A R Abrham MSc), School of Nursing and Midwifery (T T Dasa MSc, K T Roba PhD), School of Pharmacy (J Abdela MSc, Y Ayele MSc, D Edessa MSc, G Mengistu MSc, M S Shiferaw MSc, M M Zeleke MSc), School of Public Health (A G Bali MPH, F A Kumsa MPH, M G Tekle MPH), Haramaya University, Harar, Ethiopia (D Abate MSc, T F Gelano MSc, T Hailegiyorgis MSc, T G Tekalign MS); Department of Environmental Health Sciences and Technology (S Mereta PhD), Department of Epidemiology (M B Ahmed MPH, T T Gebrehiwot MPH), Department of Health Education & Behavioral Sciences (G T Feyissa MPH), Department of Population and Family Health (K H Abate PhD, A T Gebremedhin MPH), Mycobacteriology Research Center (E Duken MSc), Jimma University, Jimma, Ethiopia; Department of Pharmacology and Clinical Pharmacy (S M Abay PhD), School of Allied Health Sciences (E Yisma MPH), School of Nursing and Midwifery (H A Areri MSc), School of Public Health (A Berhane PhD, K Deribe PhD, W A Manamo PhD, G T Shifa PhD), Addis Ababa University, Addis Ababa, Ethiopia (G T Demoz MSc, S Getachew MPH, S Leta MSc); Cancer Biology Research Center (R Shirkoohi PhD), Cancer Research Center (A Nahvijou PhD, R Shirkoohi PhD), Community-Based Participatory-Research (CBPR) Center (Prof R Majdzadeh PhD), Department of Anatomy (S Sobhani MD), Department of Community Nutirion (A A Abdurahman PhD), Department of Epidemiology and Biostatistics (Prof S Hosseini PhD, M Mansournia PhD, M Yaseri PhD), Department of Health (H Abbastabar PhD), Department of Health Management and Economics (M Anjomshoa PhD, S Mousavi PhD), Department of Pharmacology (A Haj-Mirzaian MD, A Haj-Mirzaian MD), Department of Urology (E Amini MD), Digestive Diseases Research Institute (Prof R Malekzadeh MD, Prof A Pourshams MD, H Poustchi PhD, G Roshandel PhD, H Salimzadeh PhD, S G Sepanlou MD), Endocrinology and Metabolism Research Center (M Afarideh MD, Prof A Esteghamati MD, S Esteghamati MD), Hematologic Malignancies Research Center (A Kasaeian PhD), Hematology-Oncology and Stem Cell Transplantation Research Center (A Kasaeian PhD), Iran National Institute of Health Research (H S Sajadi PhD), Iranian National Center for Addiction Studies (INCAS) (Prof A Rahimi-Movaghar MD), Knowledge Utilization Research Center (KURC) (Prof R Majdzadeh PhD), Liver and Pancreaticobilliary Disease Research Center (H Ebrahimi MD), MS Research Center (I Abdollahpour PhD, S Eskandarieh PhD, P Heydarpour MD, Prof M Sahraian MD), Non-communicable Diseases Research Center (N Abbasi MD, H Ebrahimi MD, F Farzadfar MD, S N Irvani MD, F Pishgar MD, S Saeedi Moghaddam MSc, M Shams-Beyranvand MSc), School of Medicine (N Hafezi-Nejad MD), Sina Trauma and Surgery Research Center (Prof V Rahimi-Movaghar MD, S Saadat PhD, M Safdarian MD, Prof P Salamati MD, M Sharif-Alhoseini PhD), Uro-Oncology Research Center (M Nowroozi MD, F Pishgar MD), Tehran University of Medical Sciences, Tehran, Iran; Department of Epidemiology, Biostatistics, and Occupational Health (H T Ayele PhD), Montreal Neuroimaging Center (N Abbasi MD), Montreal Neurological Institute (S Fereshtehnejad PhD), McGill University, Montreal, QC, Canada; Department of Medical Parasitology (M M Khater MD), Department of Neurology (Prof F Abd-Allah MD, Prof A Abdelalim MD, M I Hegazy PhD), Cairo University, Cairo, Egypt; Community Health Sciences (Prof S B Patten PhD), Department of Oncology (O Abdel-Rahman MD), Department of Medicine (Prof M Tonelli MD), University of Calgary, Calgary, AB, Canada; Department of Entomology (A M Samy PhD), Department of Oncology (O Abdel-Rahman MD), Ain Shams University, Cairo, Egypt; Department of Anatomical Sciences (M R Salahshoor PhD), Department of Anesthesiology (A Ahmadi PhD), Department of Epidemiology & Biostatistics (Prof F Najafi PhD, Y Salimi PhD), Department of Food Technology & Quality Control (E Sadeghi PhD), Department of Health Education & Promotion (F Rajati PhD), Department of Psychiatry (Prof H Khazaie MD), Department of Traditional and Complementary Medicine (M Farzaei PhD), Department of Urology (Prof M Moradi MD), Environmental Determinants of Health Research Center (S Rezaei PhD, M Soofi PhD), Faculty of Nursing and Midwifery (A Abdi PhD), Faculty of Nutrition and Food Sciences (F Heydarpour PhD), Faculty of Public Health (B Karami Matin PhD, A Kazemi Karyani PhD, R Safari-Faramani PhD), Imam Ali Cardiovascular Research Center (S Siabani PhD), Pharmaceutical Sciences Research Center (M Farzaei PhD), Research Center for Environmental Determinants of Health (M Moradinazar PhD), Sleep Disorders Research Center (M Ghadami MD), Sports Medicine & Rehabilitation (M Shamsi PhD), Kermanshah University of Medical Sciences, Kermanshah, Iran (S Heydarpour PhD, A Khatony PhD, Prof M Pirsaheb PhD, S Rezaeian PhD, Y Safari PhD, K Sharafi PhD); Department of Epidemiology (I Abdollahpour PhD), Arak University of Medical Sciences, Arak, Iran); Multiple Sclerosis Research Center, Tehran, Iran (I Abdollahpour PhD); Department of Statistics (R S Abdulkader MD), Manonmaniam Sundaranar University, Tirunelveli, India; Anatomy Unit (T B Hagos MSc), Biomedical Sciences Division (G B Hailu MSc), Clinical Pharmacy Unit (H N Abraha MSc, T D Kassa MSc, Y L Nirayo MS, K G Weldegwergs MSc), College of Health Sciences (H T Abebe PhD), Department of Biostatistics (K Gezae MSc), Department of Epidemiology (A G Belay MPH), Department of Environmental Health and Behavioral Sciences (Y J Yasin MSc), Department of Microbiology and Immunology (S Muthupandian PhD), Department of Midwifery (Z M Zenebe MSc), Department of Nutrition and Dietetics (M G Degefa BSc, A Kahsay MPH), Institute of Biomedical Science (E T Asfaw MSc), School of Medicine (D T Mengistu MSc), School of Pharmacy (S W Asgedom MSc, T M Atey MS, A K Gebre MSc, A G Tsadik MSc, E M Yimer MSc), School of Public Health (B M Adhena MPH, A B Belachew MSc, G B Gebregergs MPH), Mekelle University, Mekelle, Ethiopia (E Belay MSc, B B Demtsu MSc, H G Meles MPH, K G Meles MPH, S G Tassew MSc); Department of Clinical Chemistry (M Abebe MSc, B Biadgo MSc), Department of Medical Microbiology (B Tessema PhD), Human Nutrition Department (Z Abebe MSc), Institute of Public Health (K A Alene MPH, B Bekele MPH, B A Dachew MPH, A F Dadi MPH, Y A Gelaw MPH, M A Limenih MSc, M Melku MSc, A A Muche MPH, K Muchie MSc, A A Tassew MPH, B Tilahun PhD, M M Wassie MSc), School of Nursing (D Z Anlay MSc), University of Gondar, Gondar, Ethiopia (S A Wondemagegn MSc); College of Medicine and Health Sciences (T A Abebo MPH, A K Daba MSc), Department of Reproductive Health (D T Hibstu MPH), School of Nursing and Midwifery (Z Y Kassa MSc), Hawassa University, Hawassa, Ethiopia; Department of Cardiology (Prof V Aboyans MD), Dupuytren University Hospital, Limoges, France; Institute of Epidemiology (Prof V Aboyans MD), University of Limoges, Limoges, France; Department of Healthcare Policy and Research (Prof L J Abu-Raddad PhD), Weill Cornell Medical College in Qatar, Doha, Qatar; Institute of Community and Public Health (N M Abu-Rmeileh PhD, A Husseini PhD), Birzeit University, Birzeit, Palestine; Bénin Clinical Research Institute (IRCB), Cotonou, Benin (M M K Accrombessi PhD, E F A Avokpaho MD); Nepal Development Society, Pokhara, Nepal (P Acharya MPH, B Gyawali MPH); Department of Medicine (O M Adebayo MD, O S Ogah PhD), University College Hospital, Ibadan, Ibadan, Nigeria; Department of Sociology (I A Adedeji PhD), Olabisi Onabanjo University, Ago-Iwoye, Nigeria; Department of Medical Rehabilitation (Prof R A Adedoyin PhD), Obafemi Awolowo University, Ile-Ife, Nigeria; School of Medicine (V Adekanmbi PhD), Cardiff University, UK; Department of Global Health (O O Adetokunboh MD, Prof C S Wiysonge MD), Department of Psychiatry (Prof C D H Parry PhD), Faculty of Medicine & Health Sciences (Prof P S Nyasulu PhD), Stellenbosch University, South Africa; Cochrane South Africa (O O Adetokunboh MD), Unit for Hypertension and Cardiovascular Disease (Prof A E Schutte PhD), South African Medical Research Council, Cape Town, South Africa (Prof D J Stein MD); Nepal Health Research Environment (T B Adhikari MPH), Center for Social Science and Public Health Research Nepal, Kathmandu, Nepal; Unit for Health Promotion Research (T B Adhikari MPH), University of Southern Denmark, Esbjerg, Denmark; Emergency Department (M G Adib MD), Saint Mark Hospital, Alexandria, Egypt; Ivorian Association for Family Welfare, Abidjan, Côte d'Ivoire (A K Adou MD); Sport Science Department (J C Adsuar PhD, S Villafaina MSc), University of Extremadura, Badajoz, Spain (D Collado-Mateo MSc); Department of Family Medicine (G Agarwal MD), Department of Pathology and Molecular Medicine (T O Olagunju MD), McMaster University, Hamilton, ON, Canada; Department of Gastroenterology (Prof R Aggarwal MD), Department of Nephrology (S Prakash PhD, Prof N Prasad MD), Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, India (Prof E Bhatia MD); Department of Zoology (S A Aghayan PhD), Yerevan State University, Yerevan, Armenia; Research group of Molecular Parasitology (S A Aghayan PhD), Scientific Center of Zoology and Hydroecology, Yerevan, Armenia; Department of Social and Behavioral Sciences (S Goenka PhD), Indian Institute of Public Health (Prof G V S Murthy MD, Prof S Zodpey PhD), Public Health Foundation of India, India (S Agrawal PhD, A Awasthi PhD, Prof L Dandona MD, Prof R Dandona PhD, G Kumar PhD, D K Lal MD, Prof D Prabhakaran DM); Vital Strategies, Gurugram, India (S Agrawal PhD); Research Area for Genomics and Molecular Medicine (V Scaria PhD), Research Area for Informatics and Big Data (Prof A Agrawal PhD), CSIR Institute of Genomics and Integrative Biology, Delhi, India; Department of Internal Medicine (Prof A Agrawal PhD), National School of Tropical Medicine (Prof P J Hotez), Baylor College of Medicine, Houston, TX, USA; Department of Neurosurgery (H Safari MD), Department of Public Health (M A Khafaie PhD), Education Development Center (Prof M Sayyah PsyD), Environmental Technologies Research Center (M Ahmadi PhD), Thalassemia and Hemoglobinopathy Research Center (F Rahim PhD), Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran; Cancer Research Center (Prof M Akbari MD), Department of Biostatistics (A Khajavi MSc), Department of Epidemiology (S Riahi PhD), Department of Ophthalmology (H Ahmadieh MD), Ophthalmic Epidemiology Research Center (S Safi PhD), Ophthalmic Research Center (H Ahmadieh MD, S Safi PhD, M Yaseri PhD), Research Institute for Endocrine Sciences (A Haj-Mirzaian MD, S N Irvani MD), Safety Promotion and Injury Prevention Research Center (N Jahanmehr PhD), School of Public Health (N Jahanmehr PhD), Shahid Beheshti University of Medical Sciences, Tehran, Iran; Department of Biology (M C Ahmed PhD), University Mohammed V, Morocco; Department of Health Statistics (G K Yentür MSc), Epidemiology & Disease Control (S Ma PhD), General Directorate of Health Information Systems (B Bora Basara PhD), Health and Disability Intelligence Group (I Salz MD), Israeli Center for Disease Control (I Zucker MD), NCD Prevention & Control Unit (S Ong MBBS), National Institute of Researches on Public Health (M C Ahmed PhD), Policy and Planning Division (J Sharma MPH), Research Department Prince Mohammed Bin Abdulaziz Hospital (Prof Z A Memish MD), Ministry of Health, Nouakchott, Mauritania (M Car PhD, A Chitheer MD, B Er MSc); Health Economics and Financing Research Group (A R Sarker MHE), Health Systems and Population Studies Division (S Ahmed MSc), Initiative for Non Communicable Diseases (A Naheed PhD), Maternal and Child Health Division (S Zaman MPH), International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, Bangladesh; Department of Learning, Informatics, Management, and Ethics (S Ahmed MSc), Department of Medical Epidemiology and Biostatistics (J J Carrero PhD, Prof E Weiderpass PhD), Department of Neurobiology (Prof J Ärnlöv PhD), Department of Neurobiology, Care Sciences and Society (S Fereshtehnejad PhD), Department of Public Health Sciences (Prof P Allebeck MD, Z El-Khatib PhD), Karolinska Institutet, Stockholm, Sweden; University Ferhat Abbas of Setif, Setif, Algeria (A Aichour BMedSc, I Aichour BPharm); Higher National School of Veterinary Medicine, Algiers, Algeria (M Aichour MA); Department of Civil and Environmental Engineering (A S Akanda PhD), University of Rhode Island, Kingston, RI, USA; Department of Midwifery (M Akibu MSc), Department of Public Health (M G Ansha MPH, T Kolola MPH), Debre Berhan University, Debre Berhan, Ethiopia; Institute for Advanced Medical Research and Training (R O Akinyemi PhD, Prof M O Owolabi DrM), University of Ibadan, Ibadan, Nigeria; Department of Epidemiology (T Akinyemiju PhD), University of Kentucky, Lexington, KY, USA; Dalla Lana School of Public Health (S Popova PhD), Department of Nutritional Sciences (A Badawi PhD), The Hospital for Sick Children (N Akseer PhD), The Centre for Global Child Health, Hospital for Sick Children (Prof Z A Bhutta PhD), University of Toronto, Toronto, ON, Canada; Evidence Based Practice Center (F Alahdab MD), Mayo Clinic Foundation for Medical Education and Research, Rochester, MN, USA; Research Committee (F Alahdab MD), Syrian American Medical Society, Washington, DC, USA; Internal Medicine Deparment (Z Al-Aly MD), Washington University in St Louis, Saint Louis, MO, USA; Clinical Epidemiology Center, VA Saint Louis Health Care System (Z Al-Aly MD), Department of Veterans Affairs, Saint Louis, MO, USA; School of Medicine (Prof G J Hankey MD), School of Population and Global Health (K Alam PhD), University of Western Australia, Perth, Western Australia, Australia; College of Health Sciences (G M Kassa MSc), Department of Nursing (A Alebel MSc, G A Dessie MSc, F W S Wagnew MSc), Department of Public Health (Y A Belay MPH, G D D Kibret MPH, C T Leshargie MPH, N A Moges MPH), Debre Markos University, Debre Markos, Ethiopia (H Temesgen MPH); Department of Preventive Medicine (A V Aleman MD), University of the Republic, Montevideo, Uruguay; National Centre for Epidemiology and Population Health (M Bin Sayeed MSPS, A Parisi MD), Research School of Population Health (K A Alene MPH), Australian National University, Canberra, ACT, Australia; Department of Pediatrics (B H Sobaih MD, M Temsah MD), Pediatric Intensive Care Unit (A Al-Eyadhy MD), King Saud University, Riyadh, Saudi Arabia (K Altirkawi MD); Public Health Research Center (R Ali MPH), New York University Abu Dhabi, Abu Dhabi, United Arab Emirates; Department of Psychiatry (Prof C R J Newton MD), Malaria Atlas Project (M Nguyen PhD), Nuffield Department of Population Health (R Ali MPH, D A Bennett PhD), Nuffield Department of Medicine (Prof P W Gething PhD, D J Weiss PhD), Nuffield Department of Women's and Reproductive Health (Prof K Rahimi MD), The Big Data Institute (T C D Lucas PhD), University of Oxford, London, UK (Prof V Jha MD); Qazvin University of Medical Sciences, Qazvin, Iran (M Alijanzadeh PhD); Department of Immunology (Prof A Rafiei PhD), Department of Medical Mycology (H Badali PhD), Department of Medical Mycology and Parasitology (A Vaezi PhD), Department of Neurology (N Karimi MD), Department of Pediatrics (M Rezai MD), Department of Physiology and Pharmacology (M Mohammadi PhD), Gastrointestinal Cancer Research Center (R Alizadeh-Navaei PhD), Immunogenetics Research Center (N Karimi MD), Molecular and Cell Biology Research Center (Prof A Rafiei PhD), School of Public Health (Prof A Enayati PhD), Toxoplasmosis Research Center

(Prof A Daryani PhD, S Sarvi PhD), Mazandaran University of Medical Sciences, Sari, Iran (M Fakhar PhD, A Hedayatizadeh-Omran PhD, M Nourollahpour Shiadeh PhD, Z Zare PhD); Department of Health Policy and Management (Prof S M Aljunid PhD), Kuwait University, Safat, Kuwait; International Centre for Casemix and Clinical Coding (Prof S M Aljunid PhD), National University of Malaysia, Bandar Tun Razak, Malaysia; Department of Population Health (A Alkerwi PhD), Luxembourg Institute of Health, Strassen, Luxembourg; University of Bordeaux, Bordeaux, France (Prof F Alla PhD); Swedish Research Council for Health, Working Life, and Welfare, Stockholm, Sweden (Prof P Allebeck MD); Research Program in Epidemiology & Public Health (Prof J Alonso MD), Hospital del Mar Medical Research Institute, Barcelona, Spain; Department of Experimental and Health Sciences (Prof J Alonso MD), Pompeu Fabra University, Barcelona, Spain; Department of Family and Community Medicine (Prof R M Al-Raddadi PhD), King Abdulaziz University, Jeddah, Saudi Arabia; Department of Operative and Preventive Dentistry (Prof F Schwendicke MPH), Institute of Public Health (Prof R Busse PhD, Prof E Schaeffner MD), Charité University Medical Center Berlin, Berlin, Germany (U Alsharif MD); Research Group on Health Economics (Prof N Alvis-Guzman PhD), University of Cartagena, Cartagena, Colombia; Research Group in Hospital Management and Health Policies (Prof N Alvis-Guzman PhD), University of the Coast, Barranquilla, Colombia; Sansom Institute (A Amare PhD), Wardliparingga Aboriginal Research Unit (P S Azzopardi PhD), South Australian Health and Medical Research Institute, Adelaide, South Australia, Australia; Department of Psychiatry (T Mekonen MSc), Department of Public Health Nutrition (N Fentahun PhD), Bahir Dar University, Bahir Dar, Ethiopia (A Amare PhD); Department of Diseases and Noncommunicable Diseases and Health Promotion (A M Soares Filho DSc), Department of the Health Industrial Complex and Innovation in Health (Prof D A Silveira MSc), Federal Ministry of Health, Beirut, Lebanon (Prof W Ammar PhD); Faculty of Health Sciences (Prof W Ammar PhD), American University of Beirut, Beirut, Lebanon; Department of Internal Medicine (Y A Amoako MD), Komfo Anokye Teaching Hospital, Kumasi, Ghana; Department of Clinical Pathology (Prof M El Sayed Zaki MD), Faculty of Medicine (N H Anber PhD), Mansoura University (N H Anber PhD), Mansoura University, Mansoura, Egypt; IInd Department of Dermatology (MM Constantin MD), Anatomy and Embryology Department (R I Negoi PhD), Department of General Surgery (D V Davitoiu PhD, M Hostiuc PhD), Department of Legal Medicine and Bioethics (S Hostiuc PhD), Emergency Hospital of Bucharest (Prof M Beuran PhD, I Negoi PhD), Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (C Andrei PhD, A Cucu PhD); Department of Medicine (S Androudi PhD), University of Thessaly, Volos, Greece; Department of Public Health (G T Shifa PhD, M Y Teshale MPH), Medical Laboratory Science (M Hussen MA), Arba Minch University, Arba Minch, Ethiopia (M D Animut MPH); Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran (M Anjomshoa PhD); Zahedan University of Medical Sciences, Iran (H Ansari PhD); School of Public Health (A Ansariadi PhD), Hasanuddin University, Makassar, Indonesia; Department of Health Policy and Administration (C T Antonio MD), Development and Communication Studies (E K Macarayan PhD), University of the Philippines Manila, Manila, Philippines; Department of Sociology and Social Work (S Appiah MPhil), School of Medical Sciences (B Awuah MBA), Kwame Nkrumah University of Science and Technology, Kumasi, Ghana; Center for International Health (S Appiah MPhil, D Paudel PhD), Ludwig Maximilians University, Munich, Germany; School of Health Sciences (O Aremu PhD), Birmingham City University, Birmingham, England; School of Health and Social Studies (Prof J Ärnlöv PhD), Dalarna University, Falun, Sweden; Department of Community Health Sciences (A Artaman PhD), University of Manitoba, Winnipeg, MB, Canada; Monitoring Evaluation and Operational Research Project (K K Aryal PhD), Abt Associates Nepal, Lalitpur, Nepal; Air Pollution Research Center (B Heibati PhD), Department of Community Medicine (A Tehrani-Banihashemi PhD), Department of Epidemiology (M Asadi-Lari PhD), Department of Health Policy (H Shabaninejad PhD), Department of Neuroscience (M Safdarian MD), Department of Ophthalmology (K Ghasemi Falavarjani MD), Health Management and Economics Research Center (M Behzadifar PhD), Physiology Research Center (M Yousefifard PhD), Preventive Medicine and Public Health Research Center (M Moradi-Lakeh MD, A Tehrani-Banihashemi PhD, K Vosoughi MD), Iran University of Medical Sciences, Tehran, Iran (T Beyranvand PhD, F Farhadi MD); Center of Communicable Disease Control (B Eshrati PhD), Deputy of Research and Technology (S Djalalinia PhD), International Relations Department (M Asadi-Lari PhD), Ministry of Health and Medical Education, Tehran, Iran (H Kazemeini MD, Z Kazemi MSc, Z Kazemi MSc, A Khosravi PhD); Qom University of Medical Sciences, Qom, Iran (H Asayesh MSc); Department of Medical Biotechnology (A Sahebkar PhD), Education Development Center (R Assadi PhD), Mashhad University of Medical Sciences, Mashhad, Iran; Department of Immunology (S Athari MPH), Zanjan University of Medical Sciences, Iran; University Institute of Public Health (S Atique PhD), The University of Lahore, Lahore, Pakistan; Public Health Department (S Atique PhD), University of Hail, Hail, Saudi Arabia; Center for Clinical Global Health Education (S R Atre PhD), Department of Epidemiology (S Hutfless PhD, Prof J B Nachega PhD), Department of Gastrointestinal and Hepatology (K Vosoughi MD), Department of Health Policy and Management (A T Khoja MD), Department of International Health (M N Kosek MD), Department of Radiology (N Hafezi-Nejad MD, A Haj-Mirzaian MD), School of Medicine (S Hutfless PhD), Johns Hopkins University, Baltimore, MD, USA; Dr D Y Patil Medical College (S R Atre PhD), Dr D Y Patil Vidyapeeth, Pune, India (A R Sawant MD); Department of Social Welfare (M S Atteraya PhD), Keimyung University, Daegu, South Korea; Department of Health Sciences (Prof T Brugha MD), School of Business (Prof M Ausloos PhD), University of Leicester, Leicester, UK; Center for Health Systems Research (L Avila-Burgos PhD, L Cahuana-Hurtado PhD, H Gómez-Dantés MSc, Prof I Heredia-Pi DipSocSc, M Rios-Blancas MPH, Prof E Serván-Mori DSc), Center for Nutrition and Health Research (E Denova-Gutiérrez DSc), Center for Population Health Research (C Razo-García MSc), Environmental Health Department (H Riojas PhD), National Institute of Public Health, Cuernavaca, Mexico (S Barquera PhD, I R Campos-Nonato PhD, J Campuzano Rincon PhD, Prof R Lozano PhD); Non Communicable Disease Department (F G Gankpe MD), Laboratory of Studies and Research-Action in Health, Porto Novo, Benin (E F A Avokpaho MD); Indian Institute of Public Health, Gandhinagar, India (A Awasthi PhD); Demography and Population Studies (V H Chisumpa PhD), Radiation Onclogy (B Awuah MBA), University of the Witwatersrand, Johannesburg, South Africa; Austin Clinical School of Nursing (M Rahman PhD), Department of Psychology and Counselling (Prof T Wijeratne MD), School of Nursing and Midwifery (Prof D Edvardsson PhD), The Judith Lumley Centre (B Ayala Quintanilla PhD), La Trobe University, Melbourne, Victoria, Australia; General Office for Research and Technological Transfer (B Ayala Quintanilla PhD), Peruvian National Institute of Health, Lima, Peru; Public Health Department (H T Ayele PhD, T A Zerfu PhD), Dilla University, Dilla, Ethiopia; Department of Community and Global Health (R Ayer MHSc), Department of Diabetes and Metabolic Diseases (T Yamada MD), Department of Global Health Policy (S Nomura MSc, Prof K Shibuya MD), Department of Mental Health (Prof N Kawakami PhD), University of Tokyo, Tokyo, Japan; Centre for Food and Nutrition Research (T B Ayuk PhD), Institute of Medical Research and Medicinal Plant Studies, Yaounde, Cameroon; Department of Health Studies (T B Ayuk PhD), University of South Africa, Pretoria, South Africa; Global Adolescent Health Group (P S Azzopardi PhD), Burnet Institute, Melbourne, Victoria, Australia; Department of Heath Services (N Azzopardi-Muscat PhD), University of Malta, Msida, Malta; Directorate for Policy (N Azzopardi-Muscat PhD), Directorate for Health Information and Research, Pieta, Malta; Public Health Risk Sciences Division (A Badawi PhD), Public Health Agency of Canada, Toronto, ON, Canada; Department of Environmental Health Engineering (Prof K Balakrishnan PhD), Sri Ramachandra Medical College and Research Institute, Chennai, India; Department of Hypertension (Prof M Banach PhD), Medical University of Lodz, Lodz, Poland; Polish Mothers' Memorial Hospital Research Institute (Prof M Banach PhD); Department of Research (A Banstola MPH), Public Health Perspective Nepal, Pokhara-Lekhnath Metropolitan City, Nepal; Clinic for Infectious and Tropical Diseases (A Barac PhD), Clinical Center of Serbia, Belgrade, Serbia; Centre School of Public Health and Health Management (Prof M M Santric Milicevic PhD), Faculty of Medicine (A Barac PhD, E Dubljanin PhD), Faculty of Medicine Institute of Epidemiology (I S Vujcic PhD), University of Belgrade, Belgrade, Serbia; Department of Neurosciences (Prof M A Barboza MD), Costa Rican Department of Social Security, San Jose, Costa Rica (Prof J Castillo Rivas MSc); School of Dentistry (Prof J Castillo Rivas MSc), School of Medicine (Prof M A Barboza MD), University of Costa Rica, San Pedro, Costa Rica; Department of Industrial Engineering (Prof L H Barrero DSc), Pontifical Javeriana University, Bogota, Colombia; University of Aden, Aden, Yemen (H Basaleem PhD); Barcelona Institute for Global Health (Prof Q Bassat MD), Tuberculosis Department (A L Garcia-Basteiro MD), Barcelona Institute for Global Health, Barcelona, Spain (Prof J V Lazarus PhD); Tuberculosis (A L Garcia-Basteiro MD), Manhiça Health Research Center, Manhiça, Mozambique (Prof Q Bassat MD); School of Health Sciences (A Basu PhD), University of Canterbury, Christchurch, New Zealand; Department of Medicine (S Basu PhD), Stanford University, Palo Alto, CA, USA; Melbourne Medical School, Melbourne, Victoria, Australia (Prof B T Baune PhD); Department of Psychiatry (Prof S Bazargan-Hejazi BEP), Charles R Drew University of Medicine and Science, Los Angeles, CA, USA; Department of Psychiatry and Biobehavioral Sciences (Prof S Bazargan-Hejazi BEP), University of California Los Angeles, Los Angeles, CA, USA; Department of Community Medicine (Prof N Bedi MD), Gandhi Medical College Bhopal, Bhopal, India; Jazan University, Jazan, Saudi Arabia (Prof N Bedi MD); Department of Environmental Health Science (S Gallus DSc), Department of Neuroscience (E Beghi MD, G Giussani PhD), Department of Oncology (C Bosetti PhD, M Cortinovis PhD), Department of Renal Medicine (B Bikbov MD, N Perico MD), Mario Negri Institute for Pharmacological Research, Milan, Italy (Prof G Remuzzi MD); Social Determinants of Health Research Center (M Behzadifar PhD), Lorestan University of Medical Sciences, Khorramabad, Iran (M Behzadifar MS); Department of Neurology (Prof Y Béjot PhD), University Hospital of Dijon, Dijon, France; Dijon Stroke Registry - UFR Sciences Santé (Prof Y Béjot PhD), University of Burgundy, Dijon, France; Public Health Department (B Bekele MPH, H Y Hassen MPH), Mizan-Tepi University, Teppi, Ethiopia (A Henok MPH); Dr Tewelde Legesse Health Sciences College, Mekelle, Ethiopia (S A Belay MPH); Department of Neurology (K N Sheth MD), Department of Ophthalmology and Visual Science (Prof J J Huang MD), School of Forestry and Environmental Studies (Prof M L Bell PhD), Yale University, New Haven, CT, USA; Department of Medicine (A K Bello PhD), University of Alberta, Edmonton, AB, Canada; Center for Clinical and Epidemiological Research (A C Goulart PhD), Department of Internal Medicine (I M Bensenor PhD, Prof I S Santos PhD), Department of Medicine (Prof P A Lotufo DrPH), Department of Pathology and Legal Medicine (M R Tovani-Palone MSc), Department of Psychiatry (Y Wang PhD), Division of Ophthalmology (J M Furtado MD), Laboratory of Genetics and Molecular Cardiology (A Pereira PhD), University Hospital, Internal Medicine Department (A C Goulart PhD), University of São Paulo, São Paulo, Brazil; Division of Cardiology, Medical College of Georgia at Augusta University, Augusta, GA, USA (Prof A E Berman MD); Department of Health Policy (Prof A E Berman MD), Personal Social Services Research Unit (R Kadel MPH), London School of Economics and Political Science, London, UK; Dental Institute (E Bernabe PhD), Division of Patient and Population (Prof W Marcenes PhD), Faculty of Life Sciences and Medicine (Prof P I Dargan MB, M Molokhia PhD), School of Population Health & Environmental Sciences (Prof C D A Wolfe MD), St John's Institute of Dermatology (Prof R J Hay MD), King's College London, London, UK; Hubert Department of Global Health (R S Bernstein MD), Rollins School of Public Health (Prof Y Liu PhD), Emory University, Atlanta, GA, USA; Department of Global Health (R S Bernstein MD), University of South Florida, Tampa, FL, USA; Institutes of Applied Health Research and Translational Medicine (N Bhala DPhil), Queen Elizabeth Hospital Birmingham, Birmingham, UK; IAHR/ITM (N Bhala DPhil), University of Birmingham, Birmingham, UK; Department of Infectious Disease Epidemiology (Prof C A Donnelly DSc), Department of Primary Care and Public Health (M Car PhD, Prof A Majeed MD, Prof S Rawaf PhD), Division of Brain Sciences (Prof R A Shakir MD), School of Public Health (Prof S Saxena MD), WHO Collaborating Centre for Public Health Education and Training (D L Rawaf MD), Imperial College London, London, UK (S Bhatt PhD); Department of Disease Control (J Cano PhD), Department of Health Services Research and Policy (Prof M McKee DSc), Department of Infectious Disease Epidemiology (O J Brady PhD, Prof H J Larson PhD), Department of Medical Statistics (Prof N Pearce PhD), Department of Non-communicable Disease Epidemiology (Prof S Kinra PhD, Prof D Prabhakaran DM), Faculty of Epidemiology and Population Health (S M Langan PhD), London School of Hygiene & Tropical Medicine, London, UK (S Bhattarai MD); Nepal Academy of Science & Technology, Patan, Nepal (S Bhattarai MD); The George Institute for Global Health, New Delhi, India (S Bhaumik MBBS, Prof V Jha MD, P K Maulik PhD); Center of Excellence in Women and Child Health (Prof Z A Bhutta PhD), Department of Pediatrics & Child Health (M Nisar MSc), Aga Khan University, Karachi, Pakistan; Cellular and Molecular Biology Research Center (H Nouri PhD), Department of Clinical Biochemistry (A Mosapour PhD, N Neamati MSc, H Parsian PhD), Department of Immunology (M Mohammadnia-Afrouzi PhD), Department of Pharmacology (M Mohammadi-Khanaposhtani PhD), Health Research Institute (R Ghadimi PhD, M Ghasemi-Kasman PhD), Infectious Diseases and Tropical Medicine Research Center (A Rostami PhD), Social Determinant of Health Research Center (A Bijani PhD), Student Research Committee (M Zamani MD), Babol University of Medical Sciences, Babol, Iran (M Faramarzi PhD); Woldia University, Woldia, Ethiopia (N Bililign BHlthSci); Department of Clinical Pharmacy and Pharmacology (M Bin Sayeed MSPS), University of Dhaka, Ramna, Bangladesh; Alma Mater (S M Birlik MBA), Department of Medical and Surgical Sciences (A Farioli PhD, Prof F S Violante MPH), University of Bologna, Bologna, Italy; Liaison of Turkey, Guillain-Barre Syndrome/Chronic Inflammatory Demyelinating Polyneuropathy Foundation International, Conshohocken, PA, USA (S M Birlik MBA); Department of Epidemiology and Public Health (Prof M Kivimäki PhD), Department of Health Informatics (S Chung PhD), Department of Psychology (M Kumar PhD), The UCL Centre for Global Health Economics (C Birungi MSc), University College London, London, UK; Fast-Track Implementation Department (C Birungi MSc), United Nations Programme on HIV/AIDS (UNAIDS), Gaborone, Botswana; Global Health Division (D Bisanzio PhD), Research Triangle Institute International, Research Triangle Park, NC, USA; School of Medicine (D Bisanzio PhD, F Shokraneh MSc), University of Nottingham, Nottingham, UK; Department of Health Sciences (I Filip MD), A T Still University, Brisbane, QLD, Australia (T Biswas MPH, A Radfar MD); Department of Global Public Health and Primary Care (Prof T Bjørge PhD, Prof O F Norheim PhD), Department of Psychosocial Science (A S Knudsen PhD, Prof S Øverland PhD), University of Bergen, Bergen, Norway; Department of Research (Prof E Weiderpass PhD), Cancer Registry of Norway, Oslo, Norway (Prof T Bjørge PhD); Department of Surgery (S Krishnaswami MD), Radiation Medicine (A Bleyer MD), Oregon Health and Science University, Portland, OR, USA; Department of Epidemiology, Human Genetics and Environmental Sciences (K Zhang PhD), Department of Pediatrics (A Bleyer MD), University of Texas, Houston, TX, USA (X Zhang PhD); Transport & Digital Development (D Bose PhD), World Bank, Washington, DC, USA; National Drug and Alcohol Research Centre (Prof L Degenhardt PhD), School of Medicine (P K Maulik PhD), School of Psychiatry (Prof P S Sachdev MD), School of Public Health and Community Medicine (F Sitas PhD), Transport and Road Safety (TARS) Research (S Boufous PhD), University of New South Wales, Sydney, NSW, Australia (Prof K A Dolan PhD); Vision & Eye Research Unit (Prof R Bourne MD), Anglia Ruskin University, Cambridge, UK; University of Genoa, Italy (N L Bragazzi PhD); Department of Maternal and Child Nursing and Public Health (Prof D C Malta PhD), Department of Surgery (Prof R S Gomez PhD), Faculty of Medicine

(Prof M S Rego PhD), Hospital of the Federal University of Minas Gerais (B R Nascimento PhD, Prof A P Ribeiro MD), Nutrition Department (Prof R M Claro PhD), Post-Graduate Program in Infectious Diseases and Tropical Medicine (B P Sao Jose PhD), School of Medicine and Clinical Hospital (Prof L C Brant PhD), Service of Gynecology, Obstetrics and Neonatology (Prof M S Rego PhD), Federal University of Minas Gerais, Belo Horizonte, Brazil; Institute of Epidemiology (A Brazinova MD), Comenius University, Bratislava, Slovakia; College of Public Health (M Yotebieng PhD), Department of Psychology (Prof N J K Breitborde PhD), Psychiatry and Behavioral Health Department (Prof N J K Breitborde PhD), Ohio State University, Columbus, OH, USA; Division of Clinical Epidemiology and Aging Research (Prof H Brenner MD, B Schöttker PhD), German Cancer Research Center, Heidelberg, Germany; Tuberculosis Biomarker Reserach Unit (A Goodridge PhD), Institute for Scientific Research and High Technology Services, City of Knowledge, Panama (G Britton PhD); Department of Research and Health Technology Assessment (F Castro MD), Gorgas Memorial Institute for Health Studies, Panama, Panama (G Britton PhD, I Moreno Velásquez PhD); Division Gastroenterology (K E Burke MD), Massachusetts General Hospital, Boston, MA, USA; Department of Pediatrics (Prof N Kissoon MD, S Murthy MD), School of Population and Public Health (Z A Butt PhD, F Pourmalek PhD, Prof N Sarrafzadegan MD), University of British Columbia, Vancouver, BC, Canada (J A Kopec PhD); Al Shifa School of Public Health (Z A Butt PhD), Al Shifa Trust Eye Hospital, Rawalpindi, Pakistan; School of Medicine (J Campuzano Rincon PhD), University of the Valley of Cuernavaca, Cuernavaca, Mexico; Department of Population and Health (Prof R Cárdenas DSc), Metropolitan Autonomous University, Mexico City, Mexico; Institute for Cancer Research, Prevention and Clinical Network, Florence, Italy (G Carreras PhD); Applied Molecular Biosciences Unit (Prof F Carvalho PhD), Department of Community Medicine (J V Santos MD), Institute of Biomedical Engineering (INEB) (J das Neves PhD), Institute for Research and Innovation in Health (i3S) (J das Neves PhD), Institute of Public Health (Prof F Carvalho PhD), REQUIMTE/LAQV (Prof E Fernandes PhD, Prof D M Pereira PhD), UCIBIO (J P Silva PhD), University of Porto, Porto, Portugal; Colombian National Health Observatory (C A Castañeda-Orjuela MD), National Institute of Health, Bogota, Colombia; Department of Public Health (Prof F P De la Hoz PhD), Epidemiology and Public Health Evaluation Group (C A Castañeda-Orjuela MD), National University of Colombia, Bogota, Colombia; Department of Health Planning and Economics (F Catalá-López PhD), Institute of Health Carlos III, Madrid, Spain; Department of Public Health (B Kucuk Bicer BEP), Institute of Population Studies (A Çavlin PhD), Hacettepe University, Ankara, Turkey; Institute for Positive Psychology and Education (Prof C Lonsdale PhD), Mary MacKillop Institute for Health Research (Prof E Cerin PhD), The Brain Institute (Prof C E I Szoeke PhD), Australian Catholic University, Melbourne, Victoria, Australia; Centre for Suicide Research and Prevention (Prof P Yip PhD), School of Public Health (Prof E Cerin PhD), University of Hong Kong, Hong Kong, China (Prof P Yip PhD); College of Medicine (Y Chaiah High School Diploma, Prof Z A Memish MD, M Temsah MD, O Temsah High School Diploma), Alfaisal University, Riyadh, Saudi Arabia; Independent Consultant, Belo Horizonte, Brazil (Prof A Champs PhD); Institute of Population Health Sciences (Prof H Chang DrPH), National Health Research Institutes, Zhunan township, Taiwan; College of Medicine (J Chang PhD), National Taiwan University, Taipei, Taiwan; Department of Development Studies (A Chattopadhyay PhD, M A Malik MPhil), Department of Fertility Studies (B K Panda MA), Department of Population Studies (A Patle MPH, R Yadav PhD), Department of Public Health & Mortality Studies (M H Rahman MPhil, Prof U Ram PhD), International Institute for Population Sciences, Mumbai, India (S Goli PhD, P Kumar PhD); Surgical Oncology (Prof P Chaturvedi MD), Tata Memorial Hospital, Mumbai, India; Chinese Academy of Sciences, Beijing, China (Prof W Chen PhD); Clinical Governance (P P Chiang PhD), Gold Coast Health, Gold Coast, QLD, Australia; Institute of Industrial Ecological Science (O Chimed-Ochir PhD), University of Occupational and Environmental Health, Kitakyushu, Japan; Centre of Cardiovascular Research and Education in Therapeutics (R Ofori-Asenso MSc), Department of Epidemiology and Preventive Medicine (K L Chin PhD), Monash Centre for Health Research and Implementation (B de Courten PhD), School of Public Health and Preventive Medicine (Prof F M Cicuttini PhD, Prof Y Guo PhD, S Li PhD, S Si PhD), Monash University, Melbourne, VIC, Australia (Prof A G Thrift PhD); Department of Economics (F Masiye PhD), Department of Population Studies (V H Chisumpa PhD, C Mapoma PhD), University of Zambia, Lusaka, Zambia; Biochemistry, Biomedical Science (J J Choi PhD), Seoul National University Hospital, Seoul, South Korea; Department of Neurology (T C Truelsen PhD), Institute of Clinical Medicine and Bispebjerg Hospital (Prof H Christensen DMSci), University of Copenhagen, Denmark; Department of Endocrinology (Prof N Thomas PhD), Department of Neurology (Prof J D Pandian MD), Department of Pulmonary Medicine (Prof D J Christopher MD), Christian Medical College and Hospital (CMC), Vellore, India (Prof S Varughese MD); Health Data Research UK, London, UK (S Chung PhD); Adelaide Medical School (L G Ciobanu PhD, T K Gill PhD), Joanna Briggs Institute (J Opio MPH), Robinson Research Institute (Z S Lassi PhD), University of Adelaide, Adelaide, SA, Australia (A T Olagunju MD); Scuola Medica Salernitana (M Cirillo MD), University of Salerno, Baronissi, Italy; Health Effects Institute, Boston, MA, USA (A J Cohen DSc); Faculty of Business and Management (M A Garcia-Gordillo PhD), Faculty of Education (D Collado-Mateo MSc), Institute of Physical Activity and Health (Prof P R Olivares PhD), Autonomous University of Chile, Talca, Chile; IInd Department of Dermatology (M M Constantin MD), Colentina Clinical Hospital, Bucharest, Romania; School of Medicine and Surgery (S Conti PhD, P A Cortesi PhD, A Lafranconi MD, F Madotto PhD, Prof L G Mantovani DSc), University of Milan Bicocca, Monza, Italy; NIHR Oxford Biomedical Research Centre (Prof C Cooper MEd), University of Southampton, Southampton, UK (Prof C Cooper MEd); Department of Cardiovascular Medicine (L T Cooper MD), Mayo Clinic, Jacksonville, FL, USA; Departament of Internal Medicine - Neurology (Prof S C O Martins PhD), Postgraduate Program in Epidemiology (E Cousin MS, B B Duncan MD, Prof B N G Goulart DSc, Prof M I Schmidt PhD), Federal University of Rio Grande do Sul, Porto Alegre, Brazil; Department of Family Medicine and Public Health (Prof M H Criqui MD), University of California San Diego, La Jolla, CA, USA; Centre for International Health (Prof J A Crump MD), Department of Medicine (A Ranta PhD), University of Otago, Dunedin, New Zealand; Division of Infectious Diseases and International Health (Prof J A Crump MD), Duke Global Health Institute (L L Yan PhD), Duke University, Durham, NC, USA; Division of Epidemiology and Biostatistics (Y A Gelaw MPH), Institute for Social Science Research (A A Mamun PhD, J C Maravilla PhD), Queensland Brain Institute (Prof J J McGrath MD), School of Dentistry (R Lalloo PhD), School of Public Health (L D Knibbs PhD, J G Scott PhD), School of Public Health (B A Dachew MPH), The University of Queensland, Brisbane, QLD, Australia (Prof H A Whiteford PhD); National Centre for Health Promotion and Evaluation (A Cucu PhD, A Galan), National Institute of Public Health, Bucharest, Romania; Discipline of Public Health (A F Dadi MPH), Flinders University, Adelaide, South Australia, Australia; Institute for Global Health Innovations (A K Dang MD, L H Nguyen MPH, T H Nguyen BMedSc, N T Truong BHlthSci), Duy Tan University, Hanoi, Vietnam; Biomedical Research Council (Prof C D A Wolfe MD), Clinical Toxicology Service (Prof P I Dargan MB), Guy's and St Thomas' NHS Foundation Trust, London, UK; Department of Rheumatology (Prof S K Das MD), K G Medical University, Lucknow, India; James P Grant School of Public Health (R Das Gupta MPH, M Hasan MPH, I Sutradhar MPH), Research and Evaluation Divison (M Rahman PhD), BRAC University, Dhaka, Bangladesh; Central University Tami Nadu, Thiruvarur, India (Prof A P Dash DSc); Department of Surgery (D V Davitoiu PhD), Clinical Emergency Hospital Sf. Pantelimon, Bucharest, Romania; Kazakh National Medical University, Almaty, Kazakhstan (K Davletov PhD); Department of Surgery (A Dayama MD), San Joaquin General Hospital, French Camp, CA, USA; Department of Diabetes and Vascular medicine (B de Courten PhD), Monash Health, Melbourne, VIC, Australia; Australian Institute for Suicide Research and Prevention (Prof D De leo DSc), Menzies Health Institute Queensland

(S K Tadakamadla PhD), Griffith University, Mount Gravatt, QLD, Australia; Augenpraxis Jonas (S Panda-Jonas MD), Department of Ophthalmology (Prof J B Jonas MD), Institute of Public Health (Prof J De Neve MD, B Moazen MSc, S Mohammed PhD), Medical Clinic V (Prof W März MD), Vth Department of Medicine (M E Kleber PhD), Heidelberg University, Heidelberg, Germany; Maternal and Child Wellbeing Unit (T A Zerfu PhD), Population Dynamics and Reproductive Health Unit (T Degfie PhD), African Population Health Research Centre, Nairobi, Kenya; School of Medicine (Prof R P Dellavalle MD), University of Colorado Denver, Aurora, CO, USA; Dermatology Service (Prof R P Dellavalle MD), US Department of Veterans Affairs (VA), Denver, CO, USA; Department of Clinical Pharmacy (G T Demoz MSc), Department of Medical Laboratory Sciences (M Teweldemedhin MSc), Aksum University, Aksum, Ethiopia; Department of Global Health and Infection (K Deribe PhD), Brighton and Sussex Medical School, Brighton, UK; National Health Service Scotland, UK (N Dervenis MD, G M A Wyper MSc); Department of Ophthalmology (Prof F Topouzis PhD), Aristotle University of Thessaloniki, Thessaloniki, Greece (N Dervenis MD); Department of Psychiatry (Prof D C Des Jarlais PhD), Icahn School of Medicine at Mount Sinai, New York, NY, USA; Disha Foundation, Gurgaon, India (S Dey PhD); Department of Community Medicine (S D Dharmaratne MD), University of Peradeniya, Peradeniya, Sri Lanka; Health Research Section (M Dhimal PhD), Research Section (A R Pandey MPH), Nepal Health Research Council, Kathmandu, Nepal; Ariadne Labs (E K Macarayan PhD), Department of Environmental Health (G R Wagner MD), Department of Genetics (A Pereira PhD), Department of Global Health and Population (A B Feigl PhD, Prof O F Norheim PhD), Department of Nutrition (E L Ding DSc, M S Farvid PhD), Division of General Internal Medicine and Primary Care (Prof A Sheikh MSc), Harvard Medical School (Prof S Jee PhD), Heart and Vascular Center (M Vaduganathan MD), T H Chan School of Public Health (P C Gupta DSc), Harvard University, Boston, MA, USA (M G Shrime MD, B Yakob PhD); Conservation Biology and Entomology (A A Kudom PhD), Department of Population and Health (D T Doku PhD), University of Cape Coast, Cape Coast, Ghana; Faculty of Health Sciences, Health Sciences (S Neupane PhD), Faculty of Social Sciences, Health Sciences (D T Doku PhD, P KC DipSocSc), University of Tampere, Tampere, Finland; University of Rochester, Rochester, NY, USA (E Dorsey MD); Department of Psychology (Prof S R Robinson PhD), School of Health and Biomedical Sciences (Prof K E Doyle PhD), Royal Melbourne Institute of Technology University, Bundoora, Victoria, Australia; Department of Clinical Surgery (T M Drake MD), Usher Institute of Population Health Sciences and Informatics (Prof A Sheikh MSc, I N Soyiri PhD), University of Edinburgh, Edinburgh, Scotland; Asbestos Diseases Research Institute (j Leigh MD), Sydney Medical School (S Islam PhD), Sydney School of Public Health (Prof T R Driscoll PhD, F Sitas PhD), University of Sydney, University of Sydney, Sydney, NSW, Australia (D G Hoy PhD, M A Mohammed PhD, Prof K Takahashi PhD); United Nations World Food Programme, New Delhi, India (M Dubey PhD); Department of Health Sciences (E Duken MSc), Wollega University, Nekemte, Ethiopia; Institute of Public Health (Prof D Rasella PhD), School of Medicine (Prof A R Duraes PhD), Federal University of Bahia, Salvador, Brazil; Diretoria Médica (Prof A R Duraes PhD), Roberto Santos General Hospital, Salvador, Brazil; Infectious Diseases (S Ebrahimpour PhD), Center for Infectious Diseases Research, Babol, Iran; Department of Nursing (Prof D Edvardsson PhD), Umeå University, Umea, Sweden; Department of Community Medicine (Prof A E Eggen PhD), University of Tromsø, Tromsø, Norway; College of Public Health (Prof M Elfaramawi PhD), Arkansas State University, Little Rock, AR, USA; Department of Pathology (C L Ellingsen MD), Stavanger University Hospital, Stavanger, Norway; Centre for Disease Burden (A S Knudsen PhD), Division of Mental and Physical Health (Prof S Øverland PhD), Norwegian Institute of Public Health, Oslo, Norway (C L Ellingsen MD, Prof V Skirbekk PhD, G Sulo PhD); Eijkman-Oxford Clinical Research Unit (I R Elyazar PhD), Eijkman Institute for Molecular Biology, Jakarta, Indonesia; Public Health Department (A Y Y Endries MPH), Saint Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia; Laboratory for Socio-economic Issues of Human Development and Quality of Life (Prof S P Ermakov DSc), Russian Academy of Sciences, Moscow, Russia; Central Research Institute of Cytology and Genetics (E Varavikova PhD), Department of Medical Statistics and Documentary (Prof S P Ermakov DSc), Federal Research Institute for Health Organization and Informatics of the Ministry of Health (FRIHOI), Moscow, Russia (Prof G Lebedev PhD, D O Roshchin PhD, Prof V I Starodubov DSc, S K Vladimirov PhD); Department of Public Health (R Esmaeili PhD), Social Development & Health Promotion Research Center (R Esmaeili PhD), Gonabad University of Medical Sciences, Iran; Department of Medical Parasitology and Mycology (H Fakhim PhD), Urmia University of Medical Science, Urmia, Iran, Iran; College of Medicine (M Fareed PhD), Department of Public Health (A T Khoja MD), Imam Muhammad Ibn Saud Islamic University, Riyadh, Saudi Arabia; Division of Cardiovascular Medicine (T A Farid MD, N V Singam MD, G Vaidya MD), University of Louisville, Louisville, KY, USA; National Statistical Office, Lisbon, Portugal (C S e Farinha MSc); Department of Psychology (Prof A Faro PhD), Federal University of Sergipe, Sao Cristovao, Brazil; Doctor Evidence, Santa Monica, CA, USA (M Fazeli PhD); National Institute for Stroke and Applied Neurosciences (Prof V L Feigin PhD), Auckland University of Technology, Auckland, New Zealand; Health Division (A B Feigl PhD), Organisation for Economic Co-operation and Development, Paris, France; Department of Fertility & Infertility (F Feizy MD), Sarem Fertility & Infertility Research Center (SAFIR), Tehran, Iran; Sarem Cell Research Center (SCRC), Tehran, Iran (F Feizy MD); Center for Biotechnology and Fine Chemistry (J C Fernandes PhD), Catholic University of Portugal, Porto, Portugal; Heller School for Social Policy & Management (D O Fijabi MD), Brandeis University, Waltham, MA, USA; School of Public Health (D O Fijabi MD, O O Isehunwa MD), University of Memphis, Memphis, TN, USA; Psychiatry (I Filip MD), Kaiser Permanente, Fontana, CA, USA; Department of Public Health Medicine (F Fischer PhD), Bielefeld University, Bielefeld, Germany; Sergio Arouca National School of Public Health, Rio de Janeiro, Brazil (L S Flor MPH); Federal University of Espírito Santo, Vitoria, Brazil (L S Flor MPH); Institute of Gerontology (N A Foigt PhD), National Academy of Medical Sciences of Ukraine, Kyiv, Ukraine; Department of Primary Care and Public Health (J A Ford MBChB, Prof N Steel PhD), University of East Anglia, Norwich, UK; Department of Medicine and Surgery (C Fornari PhD), University of Milano - Bicocca, Monza, Italy; College of Public Health, Medical and Veterinary Science (R C Franklin PhD), James Cook University, Townsville, Queensland, Australia; Gene Expression & Regulation Program (T Fukumoto PhD), Cancer Institute, Philadelphia, PA, USA; Department of Dermatology (T Fukumoto PhD), Kobe University, Kobe, Japan; Epidemiology and Public Health (T Fürst PhD), Malaria Vaccines (C Karema MPH), Swiss Tropical and Public Health Institute, Basel, Switzerland; University of Basel, Basel, Switzerland (T Fürst PhD); Medical Statistics (K Gambashidze MSc), Medical Statistics (S Marina MS), National Centre for Disease Control (NCDC), Tbilisi, Georgia (Prof A Gamkrelidze PhD, M Kereselidze MD); Faculty of Medicine and Pharmacy of Fez (F G Gankpe MD), University Sidi Mohammed Ben Abdellah, Fez, Morocco; International Trachoma Initiative (T Gebre PhD), Task Force for Global Health, Decatur, GA, USA; School of Public Health (A T Gebremedhin MPH, D Hendrie PhD, T R Miller PhD), Curtin University, Perth, Western Australia, Australia; Division of Human Nutrition and Health (Prof J M Geleijnse PhD), Wageningen University & Research, Wageningen, Netherlands; Directorate General for Public Health (R Genova-Maleras MSc), Regional Health Council, Madrid, Spain; Vaccines (B D Gessner MD), Pfizer Inc, Collegeville, PA, USA; Agency of Preventive Medicine, Paris, France (B D Gessner MD); Institute of Epidemiology, Biostatistics and informatics (S Getachew MPH), Institute of Medical Epidemiology (I Shiue PhD), Martin Luther University Halle-Wittenberg, Halle, Germany; Social Determinants of Health Research Center (H Ghiasvand PhD), University of Social Welfare and Rehabilitation Sciences, Iran (M Noroozi PhD); Department of Health Care Policy and Management (M Ghimire MA), University of Tsukuba, Tsukuba, Japan; Department of Respiratory Medicine (Prof A G Ghoshal MD), National Allergy, Asthma, and Bronchitis Institute, Kolkota, India; Department of Respiratory Medicine (Prof A G Ghoshal MD), Fortis Hospital, Kolkata, India; Division of Health Sciences (O A Uthman PhD), Unit of Academic Primary Care (Prof P S Gill DM), University of Warwick, Coventry, UK; Department of Community and Family Medicine (R F Gillum MD), Division of General Internal Medicine (R F Gillum MD), Howard University, Washington, DC, USA; Physical Activity and Obesity Prevention (S Goenka PhD), Centre for Chronic Disease Control, New Delhi, India (Prof S Liu PhD); Center for the Study of Regional Development (S Goli PhD), Centre for Ethics (T Khanna PhD), Jawahar Lal Nehru University, New Delhi, India; Department of Medicine (Prof R Tabarés-Seisdedos PhD), Department of Pediatric, Obstetrics and Gynecology (Prof M Tortajada-Girbés PhD), Department of Physiology (Prof M Gomez-Cabrera DrPH), Department of Psychiatry (J Martinez-Raga MD), University of Valencia, Valencia, Spain; Nursing and Health Sciences Department (P N Gona PhD), University of Massachusetts Boston, Boston, MA, USA; Department of Biostatistics and Epidemiology (S V Gopalani MPH), University of Oklahoma, Oklahoma City, OK, USA; Department of Health and Social Affairs (S V Gopalani MPH), Government of the Federated States of Micronesia, Palikir, Federated States of Micronesia; Metabolic Epidemiology Section (A Goto MD), National Cancer Center, Chuo-ku, Japan; School of Medicine (A Grada MD), School of Public Health (O O Isehunwa MD), Boston University, Boston, MA, USA; Registro Tumori Integrato (G Grosso PhD), Vittorio Emanuele University Hospital Polyclinic, Catania, Italy; Department of Epidemiology (Prof H C Gugnani PhD), Department of Microbiology (Prof H C Gugnani PhD), Saint James School of Medicine, The Valley, Anguilla; School of Dentistry (Prof A L S Guimaraes PhD), State University of Montes Claros, Montes Claros, Brazil; Department of Epidemiology (P C Gupta DSc, D N Sinha PhD), Healis Sekhsaria Institute for Public Health, Mumbai, India; Commissioner of Public Health (Prof R Gupta MD), West Virginia Bureau for Public Health, Charleston, WV, USA; Department of Health Policy, Management & Leadership (Prof R Gupta MD), West Virginia University School of Public Health, Morgantown, WV, USA; Academics and Research (Prof R Gupta MD), Rajasthan University of Health Sciences, Jaipur, India; Department of Preventive Cardiology (Prof R Gupta MD), Eternal Heart Care Centre & Research Institute, Jaipur, India; Department of Cardiology (T Gupta MD), Montefiore Medical Center, Bronx, NY, USA; Department of Epidemiology and Population Health (H Hosgood PhD), Albert Einstein College of Medicine, Bronx, NY, USA (T Gupta MD); Department of Public Health (B Gyawali MPH, K M Iburg PhD, M Katibeh DrPH), National Centre for Register-based Research (Prof J J McGrath MD), Aarhus University, Aarhus, Denmark; Department of Gastroenterology and Hepatology (Prof E J Kuipers MD), Department of Public Health (J A Haagsma PhD, S Kochhar MD), Department of Public Health (S Polinder MA), Erasmus University Medical Center, Rotterdam, Netherlands; Clinical Neurological Sciences (L A Sposato MD), Department of Clinical Neurological Sciences (V Hachinski DSc), The University of Western Ontario, London, ON, Canada; Lawson Health Research Institute, London, ON, Canada (V Hachinski DSc); Department of Family and Community Medicine (Prof R R Hamadeh DPhil), Arabian Gulf University, Manama, Bahrain; School of Health and Environmental Studies (Prof S Hamidi DrPH), Hamdan Bin Mohammed Smart University, Dubai, United Arab Emirates; Population Health Department (A J Handal PhD), University of New Mexico, Albuquerque, NM, USA; Neurology Department (Prof G J Hankey MD), Sir Charles Gairdner Hospital, Perth, Western Australia, Australia; Department of Disease, Epidemics, and Pandemics Control (J Nansseu MD), Department of Vital and Health Statistics (H L Harb MPH), Ministry of Public Health, Beirut, Lebanon; Achutha Menon Centre for Health Science Studies (P Jeemon PhD, G Mini PhD, Prof K R Thankappan MD), Cardiology Department (Prof S Harikrishnan MD), Neurology Department (Prof P Sylaja MD), Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, India (Prof P Sylaja MD); Public Health Department (L Jahangiry PhD), Tabriz University of Medical Sciences, Tabriz, Iran (H Haririan PhD, H Hassankhani PhD); Research and Development Unit (Prof J M Haro MD, A Koyanagi MD, S Tyrovolas PhD), San Juan de Dios Sanitary Park, Sant Boi de Llobregat, Spain; Department of Medicine (Prof J M Haro MD), University of Barcelona, Barcelona, Spain (S Tyrovolas PhD); Unit of Epidemiology and Social Medicine (H Y Hassen MPH), University Hospital Antwerp, Wilrijk, Belgium; Clinical Sciences (R Havmoeller PhD), Karolinska University Hospital, Stockholm, Sweden; International Foundation for Dermatology, London, UK (Prof R J Hay MD); Department of Environmental Health Engineering (M Heidari PhD), Hormozgan University of Medical Sciences, Bandar Abbas, Iran; Department of Statistics and Econometrics (Prof C Herteliu PhD, A Mirica PhD, A Pana MD), Bucharest University of Economic Studies, Bucharest, Romania; Department of Psychiatry (Prof H W Hoek MD), University Medical Center Groningen, Groningen, Netherlands; Department of Epidemiology (Prof H W Hoek MD), Department of Health and Behavior Studies (Prof I D Sigfusdottir PhD), Columbia University, New York, NY, USA; University of Texas Austin, Austin, TX, USA (M K Hole MD); Guilan Road Trauma Research Center (E Homaie Rad PhD), School of Health (E Homaie Rad PhD), Guilan University of Medical Sciences, Rasht, Iran; Transdisciplinary Centre for Qualitative Methods (P Hoogar PhD), Manipal University, Manipal, India; Nevada Division of Public and Behavioral Health, Carson City, NV, USA (M Horino MPH); Department of Computer Science (M Hosseinzadeh PhD), University of Human Development (M Hosseinzadeh PhD), University of Human Development, Sulaimaniyah, Iraq; Clinical Legal Medicine (S Hostiuc PhD), National Institute of Legal Medicine Mina Minovici, Bucharest, Romania; Department of Internal Medicine (M Hostiuc PhD), Bucharest Emergency Hospital, Bucharest, Romania; Faculty of Medicine Tunis (Prof M Hsairi MPH), Medicine School of Tunis, Baab Saadoun, Tunisia; Department of Health Management and Health Economics (Prof A Kisa PhD), Institute of Health and Society (A Htet MD, A S Winkler PhD), University of Oslo, Oslo, Norway; Department of Epidemiology and Health Statistics (Prof G Hu PhD), Central South University, Changsha, China; Health Sciences Department (A Husseini PhD), Qatar University, Doha, Qatar; School of Public Health (Prof E U Igumbor PhD), University of the Western Cape, Bellville, Cape Town, South Africa; Department of Public Health (Prof E U Igumbor PhD), Walter Sisulu University, Mthatha, South Africa; Department of Public Health and Community Medicine (O S Ilesanmi PhD), University of Liberia (O S Ilesanmi PhD), University of Liberia, Monrovia, Liberia; Global Health and Development Department (Prof U Iqbal PhD), Graduate Institute of Biomedical Informatics (D N A Ningrum MPH), Taipei Medical University, Taipei City, Taiwan, Taiwan; Department of Psychology (M A Stokes PhD), Institute for Physical Activity and Nutrition (S Islam PhD, Prof R Maddison PhD), School of Medicine (M Rahman PhD), Deakin University, Burwood, VIC, Australia; Surveillance and Health Services Research (F Islami PhD), American Cancer Society, Atlanta, GA, USA; Non-Communicable Disease Department (R Jain MD), National Health Mission, Lucknow, India; Department of Medicine (R Jain MD), Mahavir Sikshan Sansthan, Kanpur, India; Department of Parasitic Diseases (S K Jain MD), National Centre for Disease Control Delhi, Delhi, India; Medical Sciences Department (Prof M (Jakovljevic PhD), University of Kragujevac, Kragujevac, Serbia; Newcastle University, Tyne, UK (M Javanbakht PhD); Department of Surgery (S Jayaraman MD), Virginia Commonwealth University, Richmond, VA, USA; Faculty of Graduate Studies (A U Jayatilleke PhD), Institute of Medicine (A U Jayatilleke PhD), University of Colombo, Colombo, Sri Lanka; Department of Public Health (Prof S Jee PhD), Institute for Poverty Alleviation and International Development (C L Ranabhat PhD, C L Ranabhat PhD), Yonsei University, Seoul, South Korea; Department of Community Medicine (R P Jha MSc), Banaras Hindu University, Varanasi, India; Environmental Research Center (J S Ji DSc), Global Health Research Center (L L Yan PhD), Duke Kunshan University, Kunshan, China; Beijing Institute of Ophthalmology (Prof J B Jonas MD), Beijing Tongren Hospital, Beijing, China; Centre for Community Medicine (A Joshi MD, A P Pakhare MD), Department of Endocrinology, Metabolism, & Diabetes (Prof N Tandon PhD), Department of Paediatrics (Prof R Lodha MD), Department of Psychiatry (Prof R Sagar MD), All India Institute of Medical Sciences, New Delhi, India; Institution of Health and Nutrition Sciences (J J Jozwiak PhD), Czestochowa University of Technology, Czestochowa, Poland; Faculty of Medicine and Health Sciences (J J Jozwiak PhD), University of Opole, Opole, Poland; School of Health Sciences (S B Jungari MA), Savitribai Phule Pune University, Pune, India; Institute of Family Medicine and Public Health (M Jürisson PhD), University of Tartu, Tartu, Estonia; Department of Community Medicine (M K MD), Employees' State Insurance Model Hospital, Chennai, India; School of Public Health (Z Kabir PhD), University College Cork, Cork, Ireland; Department of Public Health (M Kahssay MPH, M L Liben MPH), Samara University, Samara, Ethiopia; Department of Obstetrics & Gynaecology (Prof S Zafar DrPH), A C S Medical College and Hospital, New Delhi, India (Prof U Kapil MD); Chronic Diseases (Home Care) Research Center (M Shamsizadeh MSc), Department of Epidemiology (M Karami PhD), Hamadan University of Medical Sciences, Hamadan, Iran; Department for Epidemiology (A Karch MD), Helmholtz Centre for Infection Research, Braunschweig, Germany; Quality and Equity Healthcare (C Karema MPH), Quality and Equity Health Care, Kigali, Rwanda; School of Interdisciplinary Arts and Sciences (S Karimi PhD), University of Washington Tacoma, Tacoma, WA, USA; Baqiyatallah Research Center for Gastroenterology and Liver Diseases (H Karimi-Sari MD), Student Research Committee (M Khosravi MD), Baqiyatallah University of Medical Sciences, Tehran, Iran; Department of Molecular Hepatology (H Sharafi PhD), Department of Young Investigators (H Karimi-Sari MD), Middle East Liver Disease Center, Tehran, Iran; Department of Anesthesiology & Pain Medicine (N J Kassebaum MD), Seattle Children's Hospital, Seattle, WA, USA (T B Murphy PhD); MRC/CSO Social and Public Health Sciences Unit (S V Katikireddi PhD), University of Glasgow, Glasgow, UK; School of Health Care Administration (Prof A Kaul MD), Oklahoma State University, Tulsa, OK, USA; Health Care Delivery Sciences (Prof A Kaul MD), University of Tulsa, Tulsa, OK, USA; Midwifery Program (S Kebede MSc), Salale University, Fiche, Ethiopia; ODeL campus (Prof P N Keiyoro PhD), University of Nairobi, Nairobi, Kenya (M Kumar PhD); Department of Linguistics and Germanic, Slavic, Asian, and African Languages (G R Kemp BA), Michigan State University, East Lansing, MI, USA; Alcohol, Tobacco, & Other Drug Use Research Unit (Prof C D H Parry PhD), Cochrane South Africa (E Z Sambala PhD, Prof C S Wiysonge MD), Non-Communicable Diseases Research Unit (Prof A P Kengne PhD), Medical Research Council South Africa, Cape Town, South Africa; Department of Medicine (Prof A P Kengne PhD, G A Mensah MD, J Noubiap MD, Prof K Sliwa MD, L J Zuhlke PhD), Department of Paediatrics and Child Health (L J Zuhlke PhD), Department of Psychiatry and Mental Health (Prof D J Stein MD), University of Cape Town, Cape Town, South Africa; Institute of Cardiology (Prof A Keren MD), Assuta Hospital, Tel Aviv Yaffo, Israel; Heart Failure and Cardiomyopathies Center (Prof A Keren MD), Hadassah Hebrew University Hospital, Jerusalem, Israel; Department of Public Health and Community Medicine (Prof Y S Khader PhD), Jordan University of Science and Technology, Ramtha, Jordan; School of Food and Agricultural Sciences (N Khalid PhD), University of Management and Technology, Lahore, Pakistan; Epidemiology and Biostatistics Department (E A Khan MPH), Health Services Academy, Islamabad, Pakistan; Department of Medical Microbiology & Immunology (Prof G Khan PhD), United Arab Emirates University, Al Ain, United Arab Emirates; Department of Internal Medicine (M S Khan MD), John H Stroger, Jr Hospital of Cook County, Chicago, IL, USA; Department of Internal Medicine (M S Khan MD, T J Siddiqi MB, M S Usman MB), Dow University of Health Sciences, Karachi, Pakistan; Department of Epidemiology (G Naik MPH, J A Singh MD), Department of Medicine (P Ranjan PhD, J A Singh MD), Department of Psychology (D C Schwebel PhD), University of Alabama at Birmingham, Birmingham, AL, USA (M Khan MD, A R Sawant MD); Department of Pediatrics (Prof J A Towbin MD), University of Tennessee, Knoxville, TN, USA (M Khan MD); Department of Health Policy and Management (Prof Y Khang MD), Institute of Health Policy and Management (Prof Y Khang MD), Seoul National University, Seoul, South Korea; Department of Health Research (T Khanna PhD), Division of Noncommunicable Diseases (M Sharma PhD), Division of Reproductive and Child Health (A P Sinha PhD), National Institute for Research in Environmental Health (Y D Sabde MD), National Institute of Nutrition (Prof A Laxmaiah PhD), Indian Council of Medical Research, New Delhi, India (S M Mehendale MD); International Otorhinolaryngology Research Association, Tehran, Iran (M Khosravi MD); Department of Nutrition and Health Science (Prof J Khubchandani PhD), Ball State University, Muncie, IN, USA; Clinical Epidemiology Unit (A A Kiadaliri PhD), Department of Clinical Sciences (Prof B Norrving PhD), Lund University, Lund, Sweden; Korea Health Industry Development Institute, Cheongju-si, South Korea (C Kim PhD); Department of Health Sciences (Prof D Kim DrPH), Northeastern University, Boston, MA, USA; Department of Preventive Medicine (Y Kim PhD, Prof S Yoon PhD), Korea University, Seoul, South Korea; Department of Nutrition (R W Kimokoti MD), Simmons College, Boston, MA, USA; Faculty of Health (Y Kinfu PhD), University of Canberra, Canberra, ACT, Australia; Department of Global Community Health and Behavioral Sciences (Prof A Kisa PhD), Tulane University, New Orleans, LA, USA; Department of Health Economics and Social Security (K Kissimova-Skarbek PhD), Institute of Public Health (R Topor-Madry PhD), Jagiellonian University Medical College, Krakow, Poland; Department of Public Health (Prof M Kivimäki PhD), University of Helsinki, Helsinki, Finland (T J Meretoja MD); Department of Preventive Cardiology (Prof Y Kokubo PhD), National Cerebral and Cardiovascular Center, Suita, Japan; Arthritis Research Canada, Richmond, BC, Canada (J A Kopec PhD); Independent Consultant, Jakarta, Indonesia (S Kosen MD); Department of Internal and Pulmonary Medicine (Prof P A Koul MD), Sheri Kashmir Institute of Medical Sciences, Srinagar, India; Research Center of Neurology, Moscow, Russia (M A Kravchenko PhD); Department of Anthropology (K Krishan PhD), Panjab University, Chandigarh, India; Department of Demography (Prof B Kuate Defo PhD), Department of Social and Preventive Medicine (Prof B Kuate Defo PhD), University of Montreal, Montreal, QC, Canada; Department of Public Health (B Kucuk Bicer BEP), Yuksek Ihtisas University, Ankara, Turkey; Center for Midwifery, Child and Family Health (F A Kumsa MPH), School of Health (S Siabani PhD), University of Technology Sydney, Sydney, New South Wales, Australia; Department of Pediatrics (S D Lad MD), School of Public Health (Prof J S Thakur MD, Prof J S Thakur MD), Post Graduate Institute of Medical Education and Research, Chandigarh, India; Center for Translation Research and Implementation Science (G A Mensah MD), Institute of Health Policy and Development Studies (Prof H Lam PhD), National Heart, Lung, and Blood Institute (E K Peprah PhD), National Institutes of Health, Manila, Philippines (A Pervaiz MHA); Department of Community and Family Medicine (F H Lami PhD), Academy of Medical Science, Baghdad, Iraq; Division of Cancer Epidemiology & Genetics (Q Lan PhD), National Cancer Institute, Rockville, MD, USA; Medical Officers (Prof V C Lansingh PhD), HelpMeSee, New York, NY, USA; Relaciones Internacionales (Prof V C Lansingh PhD), Mexican Institute of Ophthalmology, Queretaro, Mexico; Belo Horizonte City Hall (Prof S Lansky PhD), Municipal Health Department of Belo Horizonte, Belo Horizonte, Brazil; Disease Control Department (D O Laryea MD), Ghana Health Service, Accra, Ghana; Department of Public Health (A Latifi PhD), Managerial Epidemiology Research Center (S Safiri PhD), Maragheh University of Medical Sciences, Maragheh, Iran; Department of Neurology and Psychiatry (P M Lavados MD), German Clinic of Santiago, Santiago, Chile; Department of Neurological Sciences (P M Lavados MD), University of Chile, Santiago, Chile; Department of Information and Internet Technologies (Prof G Lebedev PhD, S K Vladimirov PhD), I M Sechenov First Moscow State Medical University, Moscow, Russia; School of Nursing (P H Lee PhD), Hong Kong Polytechnic University, Hong Kong, China; Regional Centre for the Analysis of Data on Occupational and Work-related Injuries and Diseases (M Levi PhD), Local Health Unit Tuscany Centre, Florence, Italy; Department of Health Sciences (M Levi PhD), University of Florence, Florence, Italy; Department of Clinical Research and Epidemiology (Y Li PhD, Y Li PhD), Shenzhen Sun Yat-sen Cardiovascular Hospital, Shenzhen, China; West China Second University Hospital of Sichuan University, Chengdu, China (X Li PhD); National Office for Maternal and Child Health Surveillance, Chengdu, China (Prof J Liang MD, Prof Y Wang MD, Prof J Zhu MD); National Center of Birth Defects Monitoring of China, Chengdu, China (Prof J Liang MD, Prof Y Wang MD); Division of Injury Prevention and Mental Health Improvement (P Ye MPH), Noncommunicable Disease

Control and Prevention Center (M Zhou PhD), Chinese Center for Disease Control and Prevention, Beijing, China (Prof X Liang MD); Department of Medicine (L Lim MD), University of Malaya, Kuala Lumpur, Malaysia; Department of Medicine and Therapeutics (L Lim MD), The Chinese University of Hong Kong, Shatin, China; School of Public Health (Prof S Linn DrPH), University of Haifa, Haifa, Israel; University of Bari Aldo Moro, Bari, Italy (Prof G Logroscino PhD); Department Clinical Research in Neurology (Prof G Logroscino PhD), Fondazione Cardinale Giovanni Panico Hospital, Tricase, Italy; Department of Pediatrics (S A Lorch MD), Population Studies Center (J Weiss MA), University of Pennsylvania, Philadelphia, PA, USA; Division of General Pediatrics (S A Lorch MD), Children's Hospital of Philadelphia, Philadelphia, PA, USA; Institute of Nutrition (Prof S Lorkowski PhD), Friedrich Schiller University Jena, Jena, Germany; Competence Cluster for Nutrition and Cardiovascular Health (nutriCARD), Jena, Germany (Prof S Lorkowski PhD); General Surgery Department (R Lunevicius PhD), Aintree University Hospital National Health Service (NHS) Foundation Trust, LIverpool, UK; Surgery Department (R Lunevicius PhD), University of Liverpool, LIverpool, UK; Health Data Research UK (Prof R A Lyons MD), Swansea University, Swansea, UK; Saw Swee Hock School of Public Health (S Ma PhD), Yong Loo Lin School of Medicine (Prof N Venketasubramanian MBBS), National University of Singapore, Singapore, Singapore; School of Public Health (M Yotebieng PhD), University of Kinshasa, Democratic Republic of the Congo (Prof C Mabika PhD); Department of Medicine (Prof T Wijeratne MD), Department of Paediatrics (M T Mackay PhD, Prof G C Patton MD), School of Health Science (A Meretoja MD), School of Health Sciences (Prof C E I Szoeke PhD), School of Population and Global Health (L A Thomas MPH), University of Melbourne, Melbourne, QLD, Australia (Prof A D Lopez PhD); Cardiology Department (R G Weintraub MB), Neurology Department (M T Mackay PhD), Royal Children's Hospital, Melbourne, Victoria, Australia; Cardiology (H Magdy Abd El Razek MD), Damietta University, Damietta, Egypt; Ophthalmology Department (M Magdy Abd El Razek MB), Aswan Faculty of Medicine, Aswan, Egypt; Department of Internal Medicine (D P Maghavani MBBS), Grant Medical College & Sir J J Group of Hospitals, Mumbai, India; Department of Public Health (M Majdan PhD), Trnava University, Trnava, Slovakia; Non-Communicable Diseases Research Center (Prof R Malekzadeh MD, S G Sepanlou MD), Shiraz University of Medical Sciences, Shiraz, Iran; Department of Humanities and Social Sciences (M A Malik MPhil), Indian Institute of Technology, Roorkee, Haridwar, India; Surgery Department (A Manda MD), Emergency University Hospital Bucharest, Bucharest, Romania; Pediatric Department (Prof M Tortajada-Girbés PhD), Psychiatry Department (J Martinez-Raga MD), University Hospital Doctor Peset, Valencia, Spain; Neurology Service (Prof S C O Martins PhD), Hospital Moinhos de Vento, Porto Alegre, Brazil; Campus Caucaia (F R Martins-Melo PhD), Federal Institute of Education, Science and Technology of Ceará, Caucaia, Brazil; Clinical Institute of Medical and Chemical Laboratory Diagnostics (Prof W März MD), Medical University of Graz, Graz, Austria; Graduate School (M B Marzan MSc), University of the East Ramon Magsaysay Memorial Medical Center, Quezon City, Philippines; Department of Public Health Medicine (T P Mashamba-Thompson PhD, Prof B P Ncama PhD, Prof B Sartorius PhD), University of KwaZulu-Natal, South Africa; Department of Biology and Biological Engineering (M Mazidi PhD), Chalmers University of Technology, Gothenburg, Sweden; Research, Monitoring and Evaluation (S Mehata PhD), Ipas Nepal, Kathmandu, Nepal; Neurology Department (Prof M Mehndiratta MD), Janakpuri Super Specialty Hospital Society, New Delhi, India; Preventive Oncology (Prof R Mehrotra PhD), National Institute of Cancer Prevention and Research, Noida, India; Department of Epidemiology and Biostatistics (K M Mehta DSc), University of California San Francisco, San Francisco, CA, USA; Department of Internal Medicine (V Mehta MD), SevenHills Hospital, Mumbai, India; Department of Adult Health Nursing (N Y Tawye MSc), Department of Pharmacy (G Mengistu MSc), Department of Public Health (T C Mekonnen MPH), Wollo University, Dessie, Ethiopia; College of Health Sciences (A Melese MSc), Department of Pharmacy (M M Zeleke MSc), Debre Tabor University, Debre Tabor, Ethiopia; Department of Public Health (P T N Memiah DrPH), University of West Florida, Pensacola, FL, USA; Peru Country Office (W Mendoza MD), United Nations Population Fund (UNFPA), Lima, Peru; Breast Surgery Unit (T J Meretoja MD), Neurocenter (A Meretoja MD), Helsinki University Hospital, Helsinki, Finland; Clinical Microbiology and Parasitology Unit (T Mestrovic PhD), Zagreb, Croatia; University Centre Varazdin (T Mestrovic PhD), University North, Varazdin, Croatia; School of Pharmacy (H B Mezgebe MSc), Ethiopian Academy of Medical Science, Mekelle, Ethiopia; Faculty of Humanities and Social Sciences (Y Miangotar PhD), University of N'Djaména, N'Djaména, Chad; Department of Hypertension (Prof T Miazgowski MD), Doctoral Study (B Miazgowski MD), Emergency Department (B Miazgowski MD), ZDROJE Hospital (J Widecka PhD), Pomeranian Medical University, Szczecin, Poland (K Widecka PhD); Pacific Institute for Research & Evaluation, Calverton, MD, USA (T R Miller PhD); President's Office (A Mirica PhD), National Institute of Statistics, Bucharest, Romania; Faculty of General Medicine (Prof E M Mirrakhimov MD), Kyrgyz State Medical Academy, Bishkek, Kyrgyzstan; Department of Atherosclerosis and Coronary Heart Disease (Prof E M Mirrakhimov MD), National Center of Cardiology and Internal Disease, Bishkek, Kyrgyzstan; Institute of Addiction Research (ISFF) (B Moazen MSc), Frankfurt University of Applied Sciences, Frankfurt, Germany; Department of Biology (K A Mohammad PhD), Salahaddin University, Erbil, Iraq; Erbil (K A Mohammad PhD), ISHIK University, Erbil, Iraq; Cardiovascular Research Institute (N Mohammadifard PhD, Prof N Sarrafzadegan MD), Isfahan University of Medical Sciences, Isfahan, Iran; Department of Community Medicine (M B Sufiyan MD), Health Systems and Policy Research Unit (S Mohammed PhD), Ahmadu Bello University, Zaria, Nigeria; Department of Public Health (M A Mohammed PhD), Jigjiga University, Jigjiga, Ethiopia (A A Tassew MPH); Department of Diabetology (V Mohan DSc), Madras Diabetes Research Foundation, Chennai, India; Clinical Epidemiology and Public Health Research Unit (L Monasta DSc, L Ronfani PhD), Burlo Garofolo Institute for Maternal and Child Health, Trieste, Italy; Department of Epidemiology and Biostatistics (G Moradi PhD), Social Determinants of Health Research Center (G Moradi PhD), Kurdistan University of Medical Sciences, Sanandaj, Iran; Lancaster University, Lancaster, UK (P Moraga PhD); Australian Centre for Health Services Innovation (R Pacella PhD), International Laboratory for Air Quality and Health (Prof L Morawska PhD), School of Exercise and Nutrition Sciences (Q G To PhD), Queensland University of Technology, Brisbane, QLD, Australia; Hospital de Sto António (J Morgado-da-Costa MSc), Hospital Center of Porto, Porto, Portugal; Department of Clinical Biochemistry (A Mosapour PhD), Tarbiat Modares University, Tehran, Iran; 1st Department of Ophthalmology (M M Moschos PhD), University of Athens, Athens, Greece; Biomedical Research Foundation (M M Moschos PhD), Academy of Athens, Athens, Greece; Competence Center Mortality-Follow-Up (R Westerman PhD), Demographic Change and Ageing Research Area (A Werdecker PhD), Federal Institute for Population Research, Wiesbaden, Germany (Prof U O Mueller MD); Center for Population and Health, Wiesbaden, Germany (Prof U O Mueller MD); Department of Endocrinology & Metabolism (Prof S Mukhopadhyay MD), Institute of Post Graduate Medical Education & Research, Kolkata, India; National Institute of Epidemiology, Chennai, India (M Murhekar MD); Department of Obstetrics and Gynecology (J Musa MD), University of Jos, Jos, Nigeria; Center for Global Health (J Musa MD), Department of Preventive Medicine (Y Yano PhD), Northwestern University, Chicago, IL, USA; School of Medical Sciences (K Musa PhD), Science University of Malaysia, Kubang Kerian, Malaysia; Pediatrics Department (Prof G Mustafa MD), Nishtar Medical University, Multan, Pakistan; Pediatrics & Pediatric Pulmonology (Prof G Mustafa MD), Institute of Mother & Child Care, Multan, Pakistan; Department of Epidemiology (Prof J B Nachega PhD), University of Pittsburgh, Pittsburgh, PA, USA; Institute of Epidemiology and Medical Biometry (Prof G Nagel PhD, Prof D Rothenbacher MD), Ulm University, Ulm, Germany; Department of Pulmonary Medicine (S Nair MD), Government Medical College Trivandrum, Trivandrum, India; Health Action by People, Trivandrum, India (S Nair MD); Ophthalmology (V Nangia MD), Suraj Eye Institute, Nagpur, India; Department of Public Heath (J Nansseu MD), University of Yaoundé I, Yaoundé, Cameroon; Mercy

Siant Vincent Medical Center, Toledo, OH, USA (H Nawaz MD); Cardio-Aid, Bucharest, Romania (R I Negoi PhD); Neurosciences (Prof C R J Newton MD), Kenya Medical Research Institute/Wellcome Trust Research Programme, Kilifi, Kenya; Ministry of Health, Community Development, Gender, Elderly and Children, Dar es Salaam, Tanzania (F N Ngalesoni PhD); Department of Biological Sciences (J W Ngunjiri DrPH), University of Embu, Embu, Kenya; Hanoi School of Public Health, Hanoi, Vietnam (H T Nguyen MSc, Prof H T Nguyen PhD); Public Health Science Department (D N A Ningrum MPH), State University of Semarang, Kota Semarang, Indonesia; National Department of Health (N Nolutshungu MD), South African Embassy, Pretoria, South Africa; Institute for Global Health Policy Research (S Nomura MSc), National Center for Global Health and Medicine, Shinjuku-ku, Japan; Independent Consultant, Accra, Ghana (R Ofori-Asenso MSc); Department of Medicine (O S Ogah PhD), Abia State University, Uturu, Nigeria; School of Social Sciences and Psychology (Prof A M N Renzaho PhD), Western Sydney University, Penrith, NSW, Australia (F A Ogbo PhD); Department of Preventive Medicine (I Oh PhD), Kyung Hee University, Dongdaemun-gu, South Korea; Research, Measurement, and Results (A Okoro MPH), Society for Family Health, Nigeria, FCT, Nigeria; Department of HIV/AIDS, STIs & TB (O Oladimeji MD), Human Sciences Research Council, Durban, South Africa; School of Public Health (O Oladimeji MD), University of Namibia, Oshakati Campus, Namibia; Department of Psychiatry (A T Olagunju MD), University of Lagos, Lagos, Nigeria; Centre for Healthy Start Initiative, Ikoyi, Nigeria (B O Olusanya PhD, J O Olusanya MBA); Institute of Health Science (S Ong MBBS), University of Brunei Darussalam, Gadong, Brunei; Department of Health (J Opio MPH), Lira District Local Government, Lira, Uganda; Graduate School of Public Health (Prof E Oren PhD), San Diego State University, San Diego, CA, USA; Center for Vaccine Development (J R Ortiz MD), University of Maryland, Baltimore, MD, USA; Pneumology Service (Prof J B Soriano MD), School of Medicine (Prof A Ortiz MD), Autonomous University of Madrid, Madrid, Spain; Nephrology and Hypertension (Prof A Ortiz MD), The Institute for Health Research Foundation Jiménez Díaz University Hospital, Madrid, Spain; Department of Global Health Nursing (Prof E Ota PhD), St Luke's International University, Chuo-ku, Japan; The Center for Healthcare Quality Assessment and Control (S S Otstavnov PhD), Ministry of Health of the Russian Federation, Moscow, Russia; Moscow Institute of Physics and Technology (S S Otstavnov PhD), Moscow State University, Dolgoprudny, Russia; Agricultural Economics Group (Prof A S Oyekale PhD), Department of Pediatrics (Prof S u Rahman MBBS), Hypertension in Africa Research Team (HART) (Prof A E Schutte PhD), North-West University, Mafikeng, South Africa; Department of TB & Respiratory Medicine (Prof M P A DNB), Jagadguru Sri Shivarathreeswara University, Mysore, India; University of Chichester, Chichester, UK (R Pacella PhD); Department of Medicine (S Pakhale MD), University of Ottowa, Ottawa, ON, Canada; Health Outcomes (A Pana MD), Center for Health Outcomes & Evaluation, Bucharest, Romania; Department of Medicial Humanities and Social Medicine (Prof E Park PhD), Kosin University, Busan, South Korea; Department of Medicine (S Patel MD), Maimonides Medical Center, Brooklyn, NY, USA; International Institute of Health Management Research, New Delhi, India (A Patle MPH); Population Health Group (Prof G C Patton MD), Murdoch Childrens Research Institute, Melbourne, VIC, Australia (R G Weintraub MB); Health, Nutrition, and HIV/AIDS Program (D Paudel PhD), Save the Children, Kathmandu, Nepal; Cartagena University, Cartagena, Colombia (Prof D M Pereira PhD); Independent Consultant, Glenelg, SA, Australia (Prof K Pesudovs PhD); Anesthesiology Department (A S Terkawi MD), School of Medicine (W A Petri MD), University of Virginia, Charlottesville, VA, USA; Institute of Medicine (Prof M Petzold PhD), University of Gothenburg, Gothenburg, Sweden; School of Public Health (Prof M Petzold PhD), University of Witwatersrand, Johannesburg, South Africa; Shanghai Mental Health Center (Prof M R Phillips MD), Shanghai Jiao Tong University, Shanghai, China; Basic Medical Sciences Department (J D Pillay PhD), Durban University of Technology, Durban, South Africa; Department of Environmental Hygiene (D Plass DrPH), German Federal Environment Agency, Dessau-Roßlau, Germany; Discipline of General Practice (Prof C D Pond PhD), University of Newcastle, Callaghan, NSW, Australia; Institute for Mental Health Policy Research (S Popova PhD, Prof J Rehm PhD), Centre for Addiction and Mental Health, Toronto, ON, Canada; University Medical Center Groningen (Prof M J Postma PhD), University of Groningen, Groningen, Netherlands; Askok & Rita Patel Institute of Physiotherapy (V Prakash PhD), Charotar University of Science and Technology, Anand, India; Non-communicable Diseases Research Center (M Qorbani PhD), Alborz University of Medical Sciences, Karaj, Iran; Department of Environmental & Occupational Health (D Quistberg PhD), Drexel University, Philadelphia, PA, USA; Medichem, Barcelona, Spain (A Radfar MD); Epidemiology & Biostatistics (A Rafay MS), Contech School of Public Health, Lahore, Pakistan; Department of Clinical Pediatrics (Prof S u Rahman MBBS), Sweidi Hospital, Riyadh, Saudi Arabia; Society for Health and Demographic Surveillance, Suri, India (R Rai MPH); Department of Economics (R Rai MPH), University of Goettingen, Göttingen, Germany; Medical University Innsbruck, Innsbruck, Austria (S Rajsic MD); Department of Nephrology (Prof S Raju MD), Nizam's Institute of Medical Sciences, Hyderabad, India; Department of Neurology (A Ranta PhD), Capital & Coast District Health Board, Wellington, New Zealand; Gonçalo Moniz Institute (Prof D Rasella PhD), Institute of Scientific and Technological Communication and Information in Health (R D Saldanha MPH), Oswaldo Cruz Foundation, Salvador, Brazil; University College London Hospitals, London, UK (D L Rawaf MD); Public Health England, London, UK (Prof S Rawaf PhD, Prof N Steel PhD); Department of Preventive Medicine and Occupational Medicine (C Reis MD), Loma Linda University Medical Center, Loma Linda, CA, USA; Brien Holden Vision Institute, Sydney, Australia (Prof S Resnikoff MD); Organization for the Prevention of Blindness, Paris, France (Prof S Resnikoff MD); Department of Epidemiology (S Riahi PhD), Birjand University of Medical Sciences, Iran; Department of Clinical Research (L Roever PhD), Federal University of Uberlândia, Uberlândia, Brazil; Golestan Research Center of Gastroenterology and Hepatology (G Roshandel PhD), Golestan University of Medical Sciences, Gorgan, Iran; IKIAM Amazon Regional University, Ciudad de Tena, Ecuador (E Rubagotti PhD); Department of Ocean Science and Engineering (E Rubagotti PhD), Southern University of Science and Technology, Shenzhen, China; Department of Community Health (B F Sunguya PhD), School of Public Health (G M Ruhago PhD), Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania (B F Sunguya PhD); Neuropsychiatric Institute (Prof P S Sachdev MD), Prince of Wales Hospital, Randwick, NSW, Australia; Medical Department (B Saddik PhD), University of Sharjah, Sharjah, United Arab Emirates; College of Medicine (N Salam PhD), Al-Imam Mohammad Ibn Saud Islamic Unviersity, Riyadh, Saudi Arabia; School of Health and Policy Management, Faculty of Health (Prof P Salamati MD), York University, Toronto, ON, Canada; Department of Surgery (Prof J Sanabria MD), Marshall University, Huntington, WV, USA; Department of Nutrition and Preventive Medicine (Prof J Sanabria MD), Case Western Reserve University, Cleveland, OH, USA; Nephrology Group (M Sanchez-Niño PhD), Jimenez Diaz Foundation University Hospital Institute for Health Research, Madrid, Spain; Department of Public Health (J V Santos MD), Regional Health Administration Do Norte I P, Vila Nova de Gaia, Portugal; Department of Medicine (M Sardana MD), University of Massachusetts Medical School, Worcester, MA, USA; Surgery Department (B Sathian PhD), Hamad Medical Corporation, Doha, Qatar; Faculty of Health & Social Sciences, Bournemouth University, UK (B Sathian PhD), Bournemouth University, Bournemouth, UK; UGC Centre of Advanced Study in Psychology (M Satpathy PhD), Utkal University, Bhubaneswar, India; Udyam-Global Association for Sustainable Development, Bhubaneswar, India (M Satpathy PhD); GSK Biologicals, Wavre, Belgium (M Savic PhD); Department of Public Health Sciences (M Sawhney PhD), University of North Carolina at Charlotte, Charlotte, NC, USA; Centre on Computational Biology (V Scaria PhD), Indrapastha Institute of Information Technology, Delhi, India; School of Health Sciences (Prof I J C Schneider PhD, Prof D A S Silva PhD), Federal University of Santa Catarina, Ararangua, Brazil; Child and Youth Mental Health (J G Scott PhD), Queensland

Centre for Mental Health Research, Brisbane, QLD, Australia; Department of Medical Statistics, Epidemiology and Medical Informatics (M Sekerija PhD), University of Zagreb, Zagreb, Croatia; Division of Epidemiology and Prevention of Chronic Noncomunicable Diseases (M Sekerija PhD), Croatian Institute of Public Health, Zagreb, Croatia; Langone Medical Center (A Shafieesabet MD), New York University, New York, NY, USA; Public Health Division (A Shaheen PhD), An-Najah National University, Nablus, Palestine; Independent Consultant, Karachi, Pakistan (M A Shaikh MD); Department of Basic Sciences (Prof M Sharif PhD), Department of Laboratory Sciences (Prof M Sharif PhD), Islamic Azad University, Sari, Iran; University School of Management and Entreprenuership (R Sharma PhD), Delhi Technological University, New Delhi, India; Department of Pulmonary Medicine (J She MD), Fudan University, Shanghai, China; Friedman School of Nutrition Science and Policy (P Shi PhD), Tufts University, Boston, MA, USA; National Institute of Infectious Diseases, Tokyo, Japan (M Shigematsu PhD); Finnish Institute of Occupational Health, Helsinki, Finland (R Shiri PhD); Symbiosis Institute of Health Sciences (Prof S R Shukla PhD), Symbiosis International University, Pune, India; Department of Psychology (Prof I D Sigfusdottir PhD, R Sigurvinsdottir PhD), Reykjavik University, Reykjavik, Iceland; Brasília University, Brasília, Brazil (Prof D A Silveira MSc); Department of Pulmonary Medicine (Prof V Singh MD), Asthma Bhawan, Jaipur, India; Epidemiology (D N Sinha PhD), School of Preventive Oncology, Patna, India; Pediatric Department (B H Sobaih MD), King Khalid University Hospital, Riyadh, Saudi Arabia; Service of Pulmonology (Prof J B Soriano MD), Health Research Institute of the University Hospital “de la Princesa”, Madrid, Spain; Division of Community Medicine (C T Sreeramareddy MD), International Medical University, Kuala Lumpur, Malaysia; Wadhwani Initiative for Sustainable Healthcare (WISH) Foundation, Delhi, India (Prof R K Srivastava MS); Department of Occupational Therapy (V Stathopoulou PhD), Athens University of Applied Sciences, Athens, Greece; Department of Nursing (A Sudaryanto MPH, A Sudaryanto MPH), Muhammadiyah University of Surakarta, Kartasura, Indonesia; School of Medicine (P J Sur MPH), University of California Riverside, Riverside, CA, USA; Department of Criminology, Law and Society (Prof B L Sykes PhD), University of California Irvine, Irvine, CA, USA; Carlos III Health Institute (Prof R Tabarés-Seisdedos PhD), Biomedical Research Networking Center for Mental Health Network (CiberSAM), Madrid, Spain; Cancer Control Center (T Tabuchi MD), Osaka International Cancer Institute, Osaka, Japan; Asbestos Diseases Research Institute, Sydney, NSW, Australia (Prof K Takahashi PhD); Department of Psychiatry and Behavioral Sciences (M Tavakkoli MD), New York Medical College, Valhalla, NY, USA; University Institute “Egas Moniz”, Monte da Caparica, Portugal (Prof N Taveira PhD); Research Institute for Medicines, Faculty of Pharmacy of Lisbon (Prof N Taveira PhD), University of Lisbon, Lisbon, Portugal; Selihom School of Nursing (N Y Tawye MSc), Alkan Health Science, Business and Technology College, Dessie, Ethiopia; Syrian Expatriate Medical Association (SEMA), Charlottesville, VA, USA (A S Terkawi MD); Lee Kong Chian School of Medicine (L Tudor Car PhD), Nanyang Technological University, Singapore, Singapore (S Thirunavukkarasu PhD); WHO Collaborating Centre for Viral Hepatitis (L A Thomas MPH), The Peter Doherty Institute for Infection and Immunity, Melbourne, Victoria, Australia; Department of Health Policy (Prof R Tobe-Gai PhD), National Center for Child Health and Development, Setagaya, Japan; Agency for Health Technology Assessment and Tariff System, Warszawa, Poland (R Topor-Madry PhD); Department of Health Economics (B X Tran PhD), Hanoi Medical University, Hanoi, Vietnam; Molecular Medicine and Pathology (K B Tran MD), University of Auckland, Auckland, New Zealand; Clinical Hematology and Toxicology (K B Tran MD), Military Medical University, Hanoi, Hanoi, Vietnam; King George’s Medical University, Lucknow, India (S Tripathi MD); Director in Charge (S P Tripathy MD), National Institute for Research in Tuberculosis, Chennai, India; Department of Vascular Medicine (N Tsilimparis PhD), University Heart Center of Hamburg, Hamburg, Germany; CV Medicine (Prof E Tuzcu MD), Cleveland Clinic, Cleveland, OH, USA; CV Medicine (Prof E Tuzcu MD), Cleveland Clinic Abu Dhabi, Abu Dhabi, United Arab Emirates; Department of Internal Medicine (K N Ukwaja MD), Federal Teaching Hospital, Abakaliki, Nigeria; Gomal Center of Biochemistry and Biotechnology (I Ullah PhD), Gomal University, Dera Ismail Khan, Pakistan; TB Culture Laboratory (I Ullah PhD), Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan, Pakistan; Ankara University, Ankara, Turkey (S B Uzun MSc); President (Prof P R Valdez MEd), Argentine Society of Medicine, Ciudad de Buenos Aires, Argentina; Intensive Care Unit Staff (Prof P R Valdez MEd), Velez Sarsfield Hospital, Buenos Aires, Argentina; UKK Institute, Tampere, Finland (Prof T J Vasankari MD); Department of Statistics (Prof A N Vasconcelos PhD), University of Brasilia, Brasília, Brazil; Directorate of Social Studies and Policies (Prof A N Vasconcelos PhD), Federal District Planning Company, Brasília, Brazil; Raffles Neuroscience Centre (Prof N Venketasubramanian MBBS), Raffles Hospital, Singapore, Singapore; Weill Cornell Medicine Department of Pediatrics (R Vidavalur MD), Cornell University, Ithaca, NY, USA; Occupational Health Unit (Prof F S Violante MPH), Sant’Orsola Malpighi Hospital, Bologna, Italy; Department of Health Care Administration and Economy (Prof V Vlassov MD), National Research University Higher School of Economics, Moscow, Russia; Foundation University Medical College (Y Waheed PhD), Foundation University, Rawalpindi, Pakistan; Independent Consultant, Staufenberg, Germany (A Werdecker PhD); Department of Neurology (A S Winkler PhD), Technical University of Munich, Munich, Germany; Kailuan General Hospital (Prof S Wu PhD), Kailuan General Hospital, Tangshan, China; University of Strathclyde, Glasgow, Scotland (G M A Wyper MSc); School of Medicine (Prof G Xu MD), Nanjing University, Nanjing, China; Wolkite University, Wolkite, Ethiopia (A Yeshaneh BHlthSci); Department of Biostatistics (N Yonemoto MPH), Kyoto University, Kyoto, Japan; Department of Health Policy and Management (Prof M Z Younis DrPH), Jackson State University, Jackson, MS, USA; Tsinghua University (Prof M Z Younis DrPH), Tsinghua University, Beijing, China; Department of Epidemiology and Biostatistics (Prof C Yu PhD), Global Health Institute (Prof C Yu PhD), Wuhan University, Wuhan, China; Department of Cardiology (G Zachariah MD), Mother Hospital, Thrissur, India; Epidemiology and Cancer Registry Sector (Prof V Zadnik PhD), Institute of Oncology Ljubljana, Ljubljana, Slovenia; Epidemiology (Prof Z Zaidi PhD), University Hospital of Setif, Setif, Algeria; Department of Prevention and Evaluation (Prof H Zeeb MD), Leibniz Institute for Prevention Research and Epidemiology, Bremen, Germany; School of Public Health (I Zucker MD), Tel Aviv University, Tel Aviv, Israel.

Contributors

Please see appendix 1 for more detailed information about individual authors’ contributions to the research, divided into the following categories: managing the estimation process; writing the first draft of the manuscript; providing data or critical feedback on data sources; developing methods or computational machinery; applying analytical methods to produce estimates; providing critical feedback on methods or results; drafting the work or revising it critically for important intellectual content; extracting, cleaning, or cataloguing data; designing or coding figures and tables; and managing the overall research enterprise.

Declaration of interests

Yannick Bejot reports grants and personal fees from AstraZeneca and Boehringer Ingelheim and personal fees from Daiichi-Sankyo, BMS, Pfizer, Medtronic, Bayer, Novex Pharma, and MSD. Adam Berman reports personal fees from Philips. Boris Bikbov has received funding from the European Union’s Horizon 2020 research and innovation programme under Marie Sklodowska-Curie grant agreement No. 703226. Boris Bikbov acknowledges that work related to this paper has been done on the behalf of the GBD Genitourinary Disease Expert Group. Cyrus Cooper reports personal fees from Alliance for Better Bone Health, Amgen, Eli Lilly, GlaxoSmithKline, Medtronic, Merck, Novartis, Pfizer, Roche, Servier, Takeda, and UCB. Mir Sohail Fazeli reports personal fees from Doctor Evidence LLC. Bradford Gessner reports other income from Pfizer Vaccines. Panniyammakal Jeemon reports a Clinical and Public Health Intermediate Fellowship from the Wellcome Trust-DBT India Alliance (2015–2020). Jacek Jóźwiak reports a grant and personal fees from Valeant, personal fees from ALAB

Laboratoria and Amgen, and non-financial support from Microlife and Servier. Nicholas Kassebaum reports personal fees and other from Vifor Pharmaceuticals, LLC. Srinivasa Vittal Katikireddi reports grants from NHS Research Scotland (SCAF/15/02), Medical Research Council (MC_UU_12017/13 and MC_UU_12017/15), and Scottish Government Chief Scientist Office (SPHSU13 and SPHSU15). Pablo Lavados reports grants from Bayer AG, PHRI, The George Institute for Global Health, Conicyt Fonis, and Clinica Alemania; non-financial support from Boehringer Ingelheim; grant support for RECCA registry and travel expenses for Nandu Proyect, and other support from EVERpharma. Jeffrey Lazarus reports personal fees from Janssen and CEPHEID and grants and personal fees from AbbVie, Gilead Sciences, and MSD. Winfried März reports grants and personal fees from Siemens Diagnostics, Aegerion Pharmaceuticals, Amgen, AstraZeneca, Danone Research, Pfizer, BASF, Numares AG, and Berline-Chemie; personal fees from Hoffmann LaRoche, MSD, Sanofi, and Synageva; grants from Abbott Diagnostics; and other from Synlab Holding Deutschland GmbH. Walter Mendoza is currently a Program Analyst for Population and Development at the Peru Country Office of the United Nations Population Fund (UNFPA) which does not necessarily endorse this study. Bo Norrving reports personal fees from AstraZeneca and Bayer. Constance Dimity Pond reports personal fees from Nutricia advisory board, acted as an unpaid consultant to the Wicking Dementia Research and Education Centre in Tasmania for development of general practitioner education on dementia (airfares and accommodation paid), was paid as a dementia clinical lead and dementia pathways adviser for the Sydney North Primary Health Network, and paid as a GP educator for Presbyterian Aged Care. Maarten Postma reports grants from Mundipharma, Bayer, BMS, AstraZeneca, ARTEG, and AscA; grants and personal fees from Sigma Tau, MSD, GlaxoSmithKline, Pfizer, Boehringer Ingelheim, Novavax, Ingress Health, AbbVie, and Sanofi; personal fees from Quintiles, Astellas, Mapi, OptumInsight, Novartis, Swedish Orphan, Innoval, Jansen, Intercept, and Pharmerit, and stock ownership in Ingress Health and Pharmacoeconomics Advice Groningen (PAG Ltd). Kazem Rahimi reports grants from NIHR BRC, ESRC, and Oxford Martin School. Miloje Savic is employed by GlaxoSmithKline Biologicals, S.A, Belgium. Kenji Shibuya reports grants from Ministry of Health, Labour, and Welfare and from Ministry of Education, Culture, Sports, Science, and Technology. Mark Shrime reports grants from Mercy Ships and Damon Runyon Cancer Research Foundation. Jasvinder Singh reports consulting for Horizon, Fidia, UBM LLC, Medscape, WebMD, the National Institutes of Health, and the American College of Rheumatology; they serve as the principal investigator for an investigator-initiated study funded by Horizon pharmaceuticals through a grant to DINORA, Inc., a 501c3 entity; they are on the steering committee of OMERACT, an international organisation that develops measures for clinical trials and receives arms-length funding from 36 pharmaceutical companies. Cassandra Szoeke reports a grant from the National Medical Health Research Council, Lundbeck, Alzheimer's Association, and the Royal Australasian College of Practicioners; she holds patent PCT/AU2008/001556. Amanda Thrift reports grants from National Health and Medical Research Council, Australia. Muthiah Vaduganathan receives research support from the NIH/NHLBI and serves as a consultant for Bayer AG and Baxter Healthcare. Marcel Yotebieng reports grants from the US National Institutes of Health. All other authors declare no competing interests.

Data sharing

To download the data used in these analyses, please visit the Global Health Data Exchange at http://ghdx.healthdata.org/gbd–2017.

Acknowledgments

Research reported in this publication was supported by the Bill & Melinda Gates Foundation, the University of Melbourne, Public Health England, the Norwegian Institute of Public Health, St. Jude Children's Research Hospital, the National Institute on Aging of the National Institutes of Health (award P30AG047845), and the National Institute of Mental Health of the National Institutes of Health (award R01MH110163). The content is solely the responsibility of the authors and does not necessarily represent the official views of the funders. Data for this research was provided by MEASURE Evaluation, funded by the United States Agency for International Development (USAID). Views expressed do not necessarily reflect those of USAID, the US Government, or MEASURE Evaluation. The Palestinian Central Bureau of Statistics granted the researchers access to relevant data in accordance with licence no. SLN2014-3-170, after subjecting data to processing aiming to preserve the confidentiality of individual data in accordance with the General Statistics Law—2000. The researchers are solely responsible for the conclusions and inferences drawn upon available data.

References

1 Harkness AG. Age at marriage and at death in the Roman Empire. *Trans Am Philol Assoc* 1896; **27:** 35–72.

2 Scheidel W. Disease and death in the ancient city of Rome. Rochester: Social Science Research Network, 2009. https://papers.ssrn.com/abstract=1347510 (accessed July 13, 2018).

3 UN. Sustainable development knowledge platform. https://sustainabledevelopment.un.org/sdgs (accessed July 13, 2018).

4 GBD 2016 Mortality Collaborators. Global, regional, and national under-5 mortality, adult mortality, age-specific mortality, and life expectancy, 1970–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet* 2017; **390:** 1084–150.

5 Ahmad OB, Lopez AD, Inoue M. The decline in child mortality: a reappraisal. *Bull World Health Organ* 2000; **78:** 1175–91.

6 You D, Jin NR, Wardlaw T. Levels & trends in child mortality. 2012. http://ihi.eprints.org/714/ (accessed July 13, 2018).

7 Centers for Disease Control and Prevention (CDC). Trends in aging—United States and worldwide. *MMWR Morb Mortal Wkly Rep* 2003; **52:** 101–04, 106.

8 Roser M. Life expectancy. Our World in Data, 2018. https://ourworldindata.org/life-expectancy#rising-life-expectancy-around-the-world (accessed July 13, 2018).

9 US Burden of Disease Collaborators. The State of US health, 1990–2016: burden of disease, injuries, and risk factors among US States. *JAMA* 2018; **319:** 1444–72.

10 Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, et al. Inequalities in life expectancy among US counties, 1980 to 2014: temporal trends and key drivers. *JAMA Intern Med* 2017; **177:** 1003–11.

11 Kochanek KD, Murphy SL, Xu J, Arias E. Mortality in the United States, 2016. NCHS Data Brief No. 293, December 2017. https://www.cdc.gov/nchs/products/databriefs/db293.htm (accessed April 9, 2018).

12 Newton JN, Briggs ADM, Wolfe CDA. Changes in health in England, with analysis by English regions and areas of deprivation, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2015; **386:** 2257–74.

13 Fransham M, Dorling D. Have mortality improvements stalled in England? *BMJ* 2017; **357:** j1946.

14 Wang H, Abajobir AA, Abate KH, et al. Global, regional, and national under-5 mortality, adult mortality, age-specific mortality, and life expectancy, 1970–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet* 2017; **390:** 1084–150.

15 Mokdad AH, Forouzanfar MH, Daoud F, et al. Health in times of uncertainty in the eastern Mediterranean region, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet Glob Health* 2016; **4:** e704–13.

16 Gómez-Dantés H, Fullman N, Lamadrid-Figueroa H, et al. Dissonant health transition in the states of Mexico, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2016; **388:** 2386–402.

17 Preston SH, Vierboom YC, Stokes A. The role of obesity in exceptionally slow US mortality improvement. *Proc Natl Acad Sci USA* 2018; **115:** 957–61.

18 Walls HL, Backholer K, Proietto J, McNeil JJ. Obesity and trends in life expectancy. *J Obesity* 2012; **2012:** 107989.

19 Angelantonio ED, Bhupathiraju SN, Wormser D, et al. Body-mass index and all-cause mortality: individual-participant-data meta-analysis of 239 prospective studies in four continents. *Lancet* 2016; **388:** 776–86.

20 Groenewald P, Nannan N, Bourne D, Laubscher R, Bradshaw D. Identifying deaths from AIDS in South Africa. *AIDS* 2005; **19:** 193–201.

21 Kahn K, Garenne ML, Collinson MA, Tollman SM. Mortality trends in a new South Africa: hard to make a fresh start. *Scand J Public Health Suppl* 2007; **69:** 26–34.

22 National Research Council (US) Committee on Population. Bobadilla JL, Costello CA, and Mitchell F, eds. Premature death in the new independent states. Washington: National Academies Press (US), 1997.

23 National Research Council (US) Committee on Population, Bobadilla JL, Costello CA, Mitchell F, eds. Epidemiological transitions in the formerly socialist economies: divergent patterns of mortality and causes of death. National Academies Press (US), 1997.

24 UN Department of Economic and Social Affairs. World population prospects: the 2017 revision. https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html (accessed April 7, 2018).

25 United States Census Bureau. International data base. https://www.census.gov/programs-surveys/international-programs/about/idb.html (accessed April 8, 2018).

26 WHO. WHO methods and data sources for global burden of disease estimates 2000–2011. http://www.who.int/healthinfo/statistics/GlobalDALYmethods_2000_2011.pdf (accessed April 8, 2018).

27 National Bureau of Statistics of China. National data. http://data.stats.gov.cn/english/mapdata.htm?cn=E0103&zb=A0301 (accessed April 8, 2018).

28 Government of India. Mortality. Open government data (OGD) platform India. https://data.gov.in/keywords/mortality (accessed April 8, 2018).

29 National Bureau of statistics (Nigeria). Population and vital statistics.pdf. http://nigerianstat.gov.ng/elibrary?queries[search]=vital (accessed April 8, 2018).

30 GBD 2015 Mortality and Causes of Death Collaborators. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016; **388:** 1459–544.

31 GBD 2017 Population and Fertility collaborators. Population and fertility by age and sex for 195 countries and territories 1950–2017: a systematic analysis for the Global Burden of Disease 2017. *Lancet* 2018; **392:** 1995–2051.

32 Stevens GA, Alkema L, Black RE, et al. Guidelines for Accurate and Transparent Health Estimates Reporting: the GATHER statement. *Lancet* 2016; **388:** e19–23.

33 Murray CJ, Rajaratnam JK, Marcus J, Laakso T, Lopez AD. What can we conclude from death registration? Improved methods for evaluating completeness. *PLoS Med* 2010; **7:** e1000262.

34 Brass W. Demographic data analysis in less developed countries: 1946–1996. *Pop Stud* 1996; **50:** 451–67.

35 Hill K. Estimating census and death registration completeness. *Asian Pac Popul Forum* 1987; **1:** 8–13, 23–4.

36 Vincent P. La mortalité des vieillards. *Population* 1951; **6:** 181–204.

37 Bennett NG, Horiuch S. Estimating the completeness of death registration in a closed population. *Popul Index* 1981; **47:** 207–21.

38 Hill K, You D, Choi Y. Death distribution methods for estimating adult mortality: Sensitivity analysis with simulated data errors. *Demogr Res* 2009; **21:** 235–54.

39 Rajaratnam JK, Tran LN, Lopez AD, Murray CJL. Measuring under-five mortality: validation of new low-cost methods. *PLoS Med* 2010; **7:** e1000253.

40 Obermeyer Z, Rajaratnam JK, Park CH, et al. Measuring adult mortality using sibling survival: a new analytical method and new results for 44 countries, 1974–2006. *PLoS Med* 2010; **7:** e1000260.

41 Department of International Economic and Social Affairs. Manual X. Indirect techniques for demographic estimation: a collaboration of the Population Division of the Department of International Economic and Social Affairs of the United Nations Secretariat with the Committee on Population and Demography of the National Research Council, United States National Academy of Sciences. New York: United Nations, 1983.

42 Global Burden of Disease Health Financing Collaborator Network. Trends in future health financing and coverage: future health spending and universal health coverage in 188 countries, 2016–40. *Lancet* 2018; **391:** 1783–98.

43 Gakidou E, Cowling K, Lozano R, Murray CJ. Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: a systematic analysis. *Lancet* 2010; **376:** 959–74.

44 Murray CJL, Ortblad KF, Guinovart C, et al. Global, regional, and national incidence and mortality for HIV, tuberculosis, and malaria during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; **384:** 1005–70.

45 Ghys PD, Brown T, Grassly NC, et al. The UNAIDS Estimation and Projection Package: a software package to estimate and project national HIV epidemics. *Sex Transm Infect* 2004; **80** (suppl 1)**:** **i**5–9.

46 McKeown T. The role of medicine: dream, mirage, or nemesis? Princeton: Princeton University Press, 2014.

47 Preston SH. The changing relation between mortality and level of economic development. *Int J Epidemiol* 2007; **36:** 484–90.

48 EM-DAT. The international disasters database. https://www.emdat.be/index.php (accessed July 13, 2018).

49 Grangereau P. La Chine creuse ses trous de mémoire. Libération. June 17, 2011. http://www.liberation.fr/planete/2011/06/17/la-chine-creuse-ses-trous-de-memoire_743211 (accessed July 13, 2018).

50 Emslie C, Hunt K. The weaker sex? Exploring lay understandings of gender differences in life expectancy: a qualitative study. *Soc Sci Med* 2008; **67:** 808–16.

51 Coale AJ, Demeny PG, Vaughan B. Regional model life tables and stable populations. New York: Academic, 1983.

52 United Nations. Age and sex patterns of mortality: model life tables for under-developed countries. Population Studies, No. 22. Department of Social Affairs. Sales No. 1955.XIII.9. New York: United Nations, 1955.

53 Gakidou E, King G. Death by survey: estimating adult mortality without selection bias from sibling survival data. *Demography* 2006; **43:** 569–85.

54 Masquelier B. Adult mortality from sibling survival data: a reappraisal of selection biases. *Demography* 2013; **50:** 207–28.